JANUARY, 1925

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Contractors' and Engineers' Monthly

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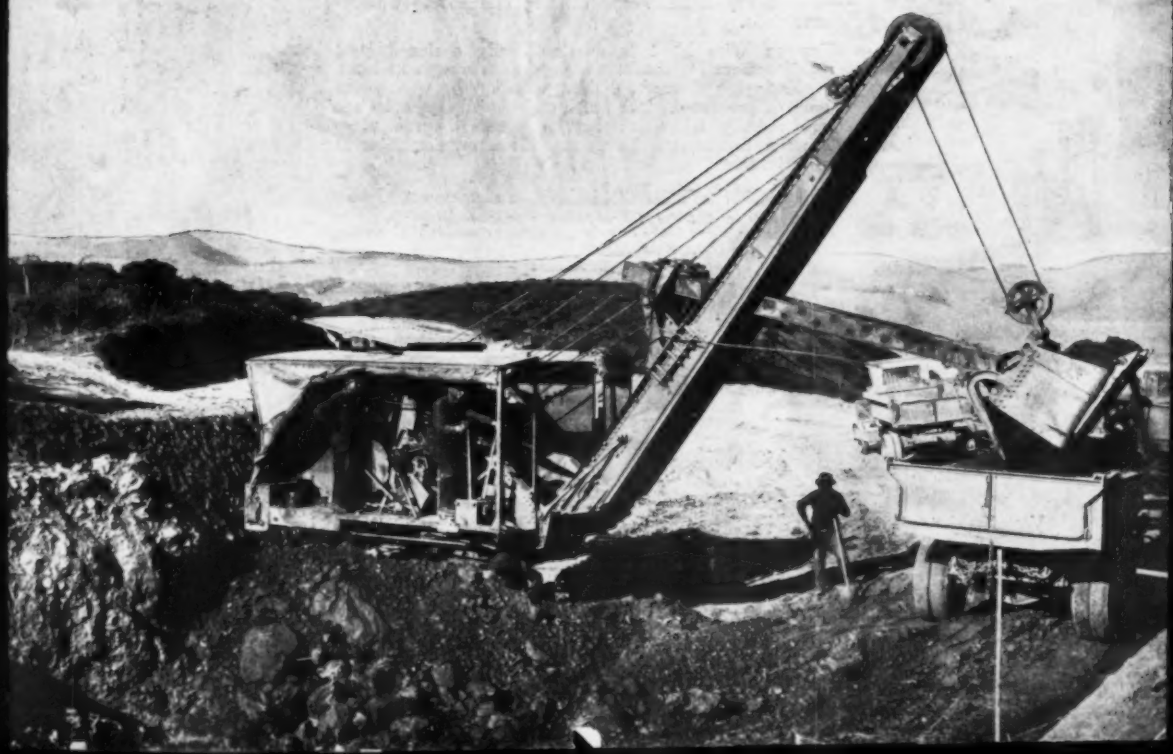

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Concrete and Steel==The Perfect Road

Concrete roadways built with steel reinforcement will resist heavy traffic, grade shifting and severe weather conditions.

Truscon Wire Mesh is a scientifically designed steel reinforcement for concrete highways. Through its binding and tying character disintegration of the road under strain is prevented. The finish and wearing qualities are impaired by frequent irregular cracks in the road. Truscon Contraction Joints provide a regular joint at wide intervals.

TRUSCON STEEL COMPANY, Youngstown, Ohio

Warehouses and Sales Offices from Pacific to Atlantic. For addresses see phone books of principal cities. Canada: Walkerville, Ont. Foreign Div.: New York.

Truscon Wire Mesh will prevent surface cracking with its consequent deterioration from weathering.

TRUSCON WIRE MESH AND CONTRACTION JOINTS

Truscon Contraction Joints allow for center separation in new roads and furnish a permanent guide line for traffic.

VOL. X. No. 1 CONTRACTORS' & ENGINEERS' MONTHLY JANUARY, 1925
Entered as second-class matter, April 16, 1923, at the Post Office at New York, N. Y., under Act of March 3, 1879
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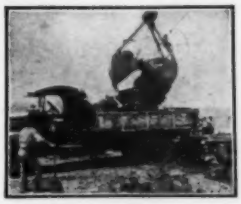
Where to Purchase

A comprehensive classification of the leading machinery and supply manufacturers arranged for the convenience of contractors, engineers and public officials who may wish to secure information about construction equipment.



The Index to Advertisers faces the inside back cover. When writing to advertisers please mention the CONTRACTORS' & ENGINEERS' MONTHLY. A star (*) before the manufacturer's name indicates that his advertisement appears in this issue.

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*Kentucky Rock Asphalt Co., Louisville, Ky.
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Sinclair Ref. Co., Chicago, Ill.
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Standard Oil Co. of La., New Orleans, La.
Standard Oil Co. of N. J., Newark, N. J.
Standard Oil Co. of N. Y., New York.

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Concrete Steel Co., New York.
Universal Form Clamp Co., Chicago, Ill.

BARS, IRON AND STEEL
Ames & Co., W., Jersey City, N. J.

** Indicates that the manufacturer carries an advertisement. See index facing inside back cover.*

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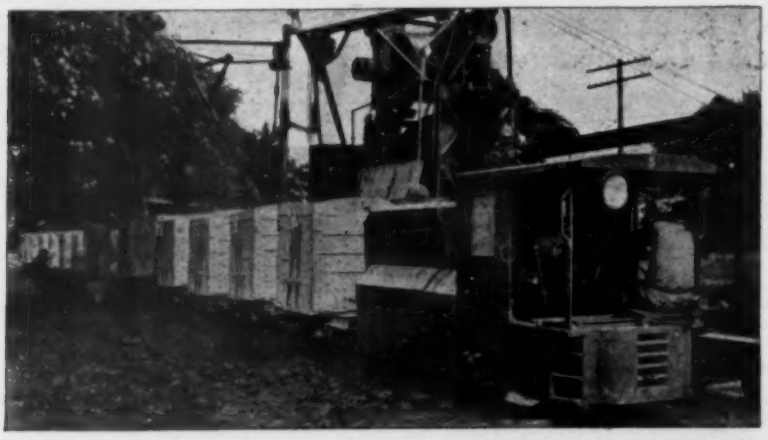

Two World's Records SMASHED!

2,671 feet of standard 18 ft. concrete pavement in one day—

10,405 feet in one week—

Those are the remarkable records hung up by Wm. C. Meneely during the past season. They are additional triumphs for Plymouth Gasoline Locomotives and industrial haulage, and naturally we take a pardonable pride in knowing that Plymouths played such a prominent part.

Read now the letter from Mr. Meneely —then write for Bulletin HC 251, showing what others are doing in your field.

THE FATE-ROOT-HEATH COMPANY
Plymouth Locomotive Works
PLYMOUTH, OHIO

W. C. Meneely Company
Decatur, Ill.

Nov. 8, 1924.

The Fate-Root-Heath Co.,
Plymouth, Ohio.

Gentlemen:

In delivering material to our 32-E Paver we use five 7-ton Plymouth Locomotives, and as we can only haul one batch to a car, it surely works them to the limit.

On July 30th of this year we broke the world's record by laying 2,671 feet of standard 18 foot concrete pavement in one day. For the week ending July 31st we also set another new record, completing 10,405 feet of standard 18-foot pavement.

All five locomotives worked perfectly without breakdowns or mishaps on this big day and week's run. On the season's run of 22.7 miles there was practically no delay caused by the Plymouth Locomotives.

We would not consider using any other Locomotive except the Plymouth.

Yours very truly,
W. C. MENEELY CO.,
(Signed) W. C. Meneely.

See Our Exhibit at
National Good Roads Show
Chicago, Jan. 5-9.

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Gulf States Steel Co., Birmingham, Ala.
Hirsch Rolling Mill Co., St. Louis, Mo.
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Inland Steel Co., Chicago, Ill.
Laclede Steel Co., St. Louis, Mo.
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Champion Bridge Co., Wilmington, O.
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*Littleford Bros., Cincinnati, O.
Stuebner Iron Works, G. L., L. I. City, N. Y.

BREAKING RECORDS WITH STREET CABLEWAYS

The great Dix Dam Project is one of the outstanding engineering problems of the age, most striking of all are the cableways supplied by Street Bros. Machine Works.

The Williamsport Wire Rope used in connection with these cableways have broken records for service, which proves that when used on cableway equipment, scientifically constructed, Williamsport Wire Rope will give longer and better service.

Send for interesting illustrated literature. It's free.

WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works:
Williamsport, Pa.

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Link-Belt Co., Chicago, Ill.
McMyler Interstate Co., Cleveland, Ohio
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Owen Bucket Co., Cleveland, Ohio.
Williams Co., G. H., Erie, Pa.

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*Smith Co., T. L., Milwaukee, Wis.
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Browning Co., Cleveland, O.
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Atlas Car & Mfg. Co., Cleveland, O.
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*Littleford Bros., Cincinnati, O.
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Akron Barrow Co., Cleveland, Ohio.
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Gray Iron Fdry. Co., Reading, Pa.
Lee Trailer & Body Co., Chicago, Ill.
Ransome Concrete Mchy. Co., Dunellen, N. J.
Toledo Wheelbarrow Co., Toledo, Ohio.

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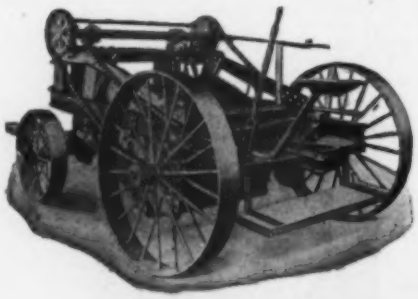
1,000 Yards of Dirt Per Day

A train of five Baker Maney Scrapers.

With two trains of four or five Baker Maney Model "D" Scrapers each, it is a common thing to move 1000 yards of dirt a day on usual hauls. Yes, and this is done with only five men on the job—two tractor men and three scraper men. This yardage is obtained at a huge reduction in investment over that of any large excavators. Think this over before you invest in dirt moving machinery. Baker Maneys are used in trains of three to six scrapers behind large tractors. Single trains move from 400 to 600 yards a day with only two scraper operators.

Remember, no teams, trucks or wagons are used with "Maney's." They dig, load, haul, dump, spread and compact. They turn in a twenty foot space. Can you think of any dirt moving device that does all this? Hundreds of outfits are used on road work. Why not adopt this teamless method on your next job and begin moving large quantities of dirt at an extremely low cost per yard.



Write for our illustrated catalog.

SEE OUR EXHIBIT
GOOD ROADS SHOW
Chicago
Jan. 5-9, 1925.
Space N. C. 9.

THE BAKER MFG. CO.
585 Stanford Ave. Springfield, Ill.

BAKER MANEY
Self Loading Scrapers

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Berger Mfg. Co., Canton, O.
Canton Art Metal Co., Canton, O.
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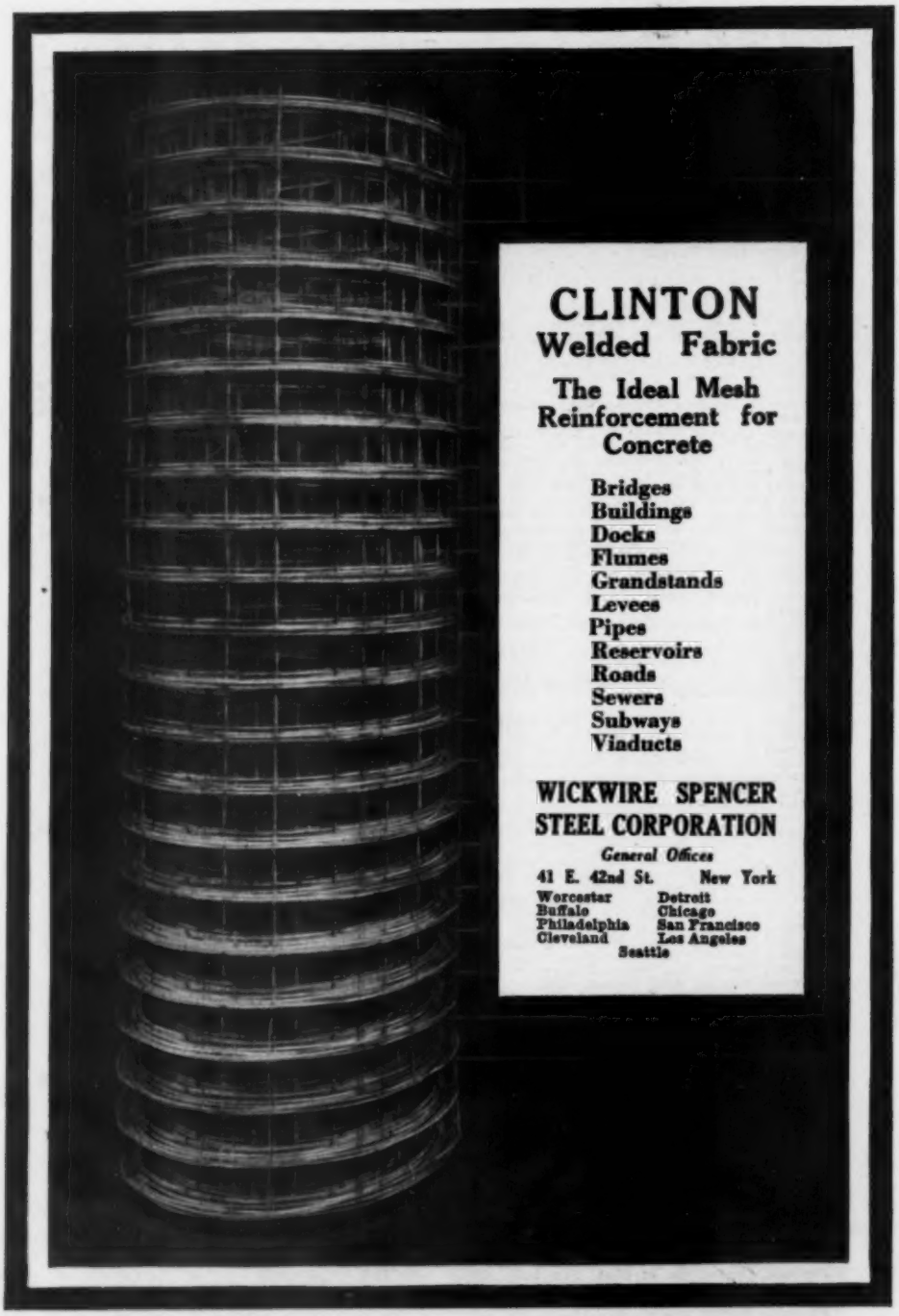
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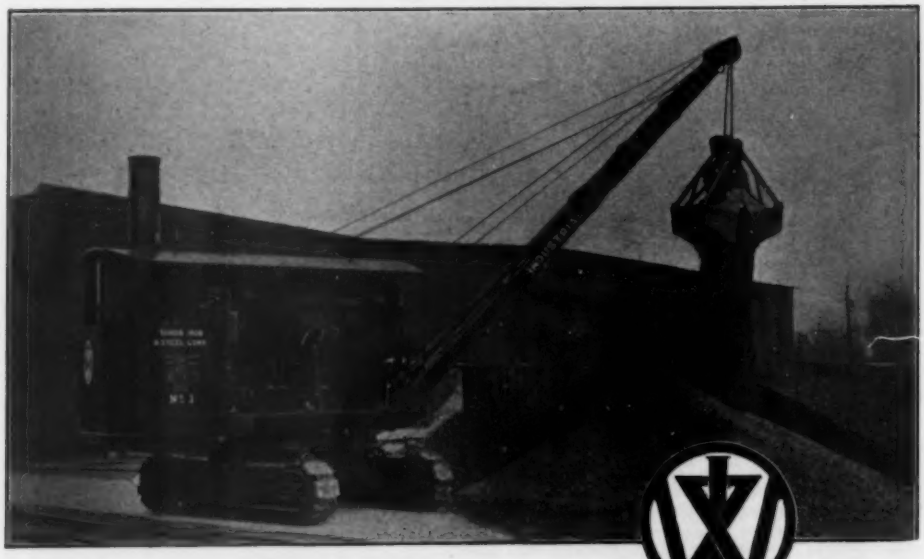

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Kinnear Mfg. Co., Columbus, O.
Variety Fire Door Co., Chicago, Ill.
Wilson Corp., J. G., New York.

DRAFTING MACHINES

Universal Drafting Machine Co., Cleveland. O.

DRAINAGE TOOLS

*Oliver Ames & Sons Corp., North Easton, Mass.
*Ames Shovel & Tool Co., Boston, Mass.
*Geo. Griffiths Co., Cheltenham, Pa.
*The H. M. Myers Co., Beaver Falls, Pa.
*T. Rowland's Sons, Inc., Cheltenham, Pa.
*St. Louis Shovel Co., Plant, St. Louis, Mo.
*Wright Shovel Co., Andersen, Ind.

DREDGES

*Bay City Dredge Works, Bay City, Mich.
*Michigan Dredge Co., Bay City, Mich.
*Osgood Co., The, Marion, O.
American Steel Dredge Co., Fort Wayne, Ind.
Bucyrus Co., South Milwaukee, Wis.
Ellicott Machine Corp'n, Baltimore, Md.
Erie Steam Shovel Co., Erie, Pa.
Hayward Co., New York.
Lidgerwood Mfg. Co., New York.
Marion Steam Shovel Co., Marion, O.
Stockton Iron Works, Stockton, Cal.
Street Bros. Machine Works, Chattanooga, Tenn.
Superior Iron Works, Superior, Wis.

DREDGES, DIPPER

*Bay City Dredge Works, Bay City, Mich.
*Osgood Co., Marion, O.
American Steel Dredge Co., Fort Wayne, Ind.
Austin Machinery Corp'n, Muskegon, Mich.
Bucyrus Co., South Milwaukee, Wis.
Fairbanks Steam Shovel Co., Marion, O.
Marion Steam Shovel Co., Marion, O.

DREDGES, HYDRAULIC

Bucyrus Co., South Milwaukee, Wis.
Ellicott Mach. Corp., Baltimore, Md.
Fairbanks Steam Shovel Co., Marion, O.
Marion Steam Shovel Co., Marion, O.
Morris Machine Works, Baldwinsville, N. Y.

DREDGING PUMPS AND ACCESSORIES

Erie Pump & Engine Wks., Medina, N. Y.

DRILLS, AIR AND ROCK

*Dallett Co., The, Philadelphia, Pa.
*Denver Rock Drill Mfg. Co., Denver, Colo.
*McKiernan-Terry Drill Co., New York.
*Wood Drill Wks., Paterson, N. J.
Chicago Pneumatic Tool Co., New York.
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Cleveland Rock Drill Co., Cleveland, Ohio.
Helwig Mfg. Co., St. Paul, Minn.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York.
Sullivan Machinery Co., Chicago, Ill.

DRILLS, CORE

*McKiernan-Terry Drill Co., New York.
*Standard Diamond Drill Co., Chicago, Ill.
Dobbins Core Drill Co., Inc., New York.
Ingersoll-Rand Co., New York.
Sullivan Mach'y Co., Chicago, Ill.

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*McKiernan-Terry Drill Co., New York.
*Wood Drill Works, Paterson, N. J.
Chicago Pneumatic Tool Co., New York.
Cleveland Pneumatic Tool Co., Cleveland, O.
Cleveland Rock Drill Co., Cleveland, O.
Helwig Mfg. Co., St. Paul, Minn.
Ingersoll-Rand Co., New York.
Sullivan Machinery Co., Chicago, Ill.

DRILLS FOR WELLS AND BLAST HOLES

(See Well Drilling Machinery)

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*Blaw-Knox Co., Pittsburgh, Pa.
*Clyde Iron Wks. Sales Co., Duluth, Minn.
Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
Hayward Co., New York.
Monighan Machine Co., Chicago, Ill.

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Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Blower Co., Detroit, Mich.
American Process Co., New York.
Atlas Dryer Co., Cleveland, O.
Bartlett & Snow Co., C. O., Cleveland, O.
Cummer & Son Co., F. D., Cleveland, O.
Ruggles-Coles Eng. Co., New York.

DRYERS, SAND AND GRAVEL

*Littleford Bros., Cincinnati, Ohio.
Aereil Burner Co., Union Hill, N. J.
Bartlett & Snow Co., C. O., Cleveland, Ohio.
Chase & Lyman, Boston, Mass.

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*Easton Car & Const'n Co., Easton, Pa.
*Heil Company, Milwaukee, Wis.
*The Hug Co., Highland, Ill.
*Insley Mfg. Co., Indianapolis, Ind.
*International Motor Co., New York.
*Littleford Bros., Cincinnati, O.
*Stewart Iron Wks. Co., Cincinnati, Ohio
Columbia Body Corp., Columbia, Pa.
Columbian Steel Tank Co., Kansas City, Mo.
Griscom-Russell Co., New York.
Jennings Automatic Dump Body, Roanoke, Va.
Lee Trailer & Body Co., Chicago, Ill.
Mandt Body Co., Keokuk, Iowa.
Pechstein Iron Works, Keokuk, Iowa.
Van Dorn Iron Wks., Cleveland, Ohio.
Wood Hydr. Hoist & Body Co., Detroit, Mich.

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Eagle Wagon Works, Auburn, N. Y.
Gilbert Mfg. Co., Aberdeen, S. D.
Holsbog & Bro., Geo. H., Jeffersonville, Ind.
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Watson Products Corp., Canastota, N. Y.
Western Wheeled Scraper Co., Aurora, Ill.

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*Solvay Process Co., New York
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Llewellyn Iron Works, Los Angeles, Cal.
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Worthington Pump & Mchy. Corp., New York.

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Erie Pump & Engine Co., Medina, N. Y.
Filer-Stowell Co., Milwaukee, Wis.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
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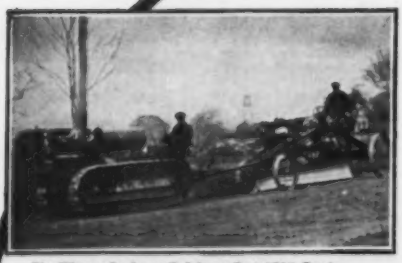

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*Osgood Co., The, Marion, O.
*Sauerman Bros., Chicago, Ill.
*Smith Co., T. L., Milwaukee, Wis.
Austin Machinery Corp'n, Muskegon, Mich.
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Browning Co., Cleveland, O.
Bucyrus Co., South Milwaukee, Wis.
Economy Excavator Co., Iowa Falls, Ia.
Erie Steam Shovel Co., Erie, Pa.
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Hayward Co., New York.
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Parsons Co., Newton, Ia.

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*Barrett Co., New York
*Carey Co., Philip, Cincinnati, Ohio.
*Texas Company, New York.
*Truscon Steel Co., Youngstown, O.
*Waring-Underwood Co., Philadelphia, Pa.
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Anchor Post Iron Works, New York.
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Frost-Superior Fence Co., Cleveland, O.
Indiana Steel & Wire Co., Muncie, Ind.
Nitselman Bros., Muncie, Ind.
Michigan Wire Fence Co., Adrian, Mich.
Page Steel & Wire Prod. Corp., Bridgeport, Conn.
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Texas Cyclone Fence Co., Fort Worth, Tex.
Youngstown Sheet & Tube Co., Youngstown, O.

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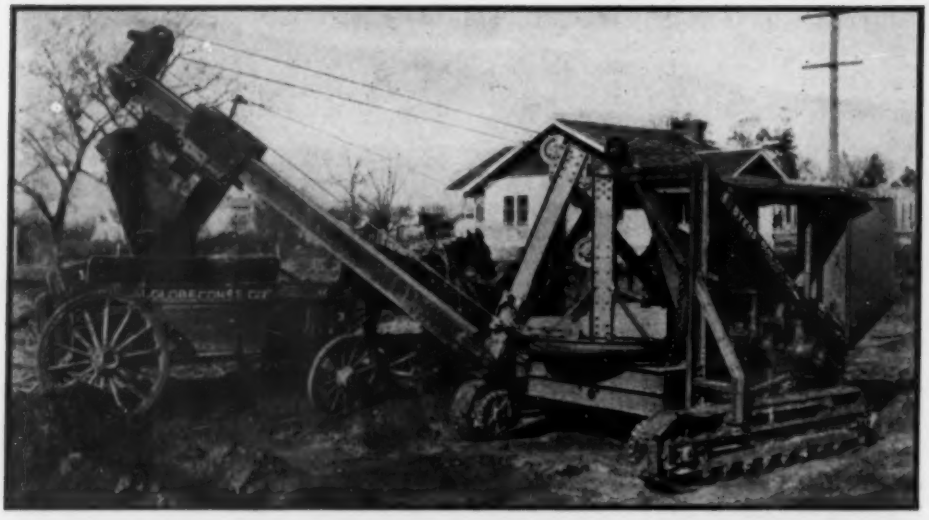

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2:10

1—Coming to a pole in the trench line.

2:13

2—Boom lifted and the Barber-Greene Ditcher dodging the pole.

2:18

3—Completely around the pole, with boom almost back to full digging depth of 5 feet 4 inches.

2:30

4—Twenty feet of new trench opened. Notice that but twelve feet six inches of trench were lost. The operator had had but one day's experience before executing this maneuver.

A Movie of a Move

A graphic twenty minute story of the exceptional mobility of the Barber-Greene Ditchers is presented in the "still movie" shown above. In this instance, but approximately ten minutes of trenching time were lost in dodging around the pole, which happened to be in the trench line.

In addition to this quick maneuver, the ditcher was able to work so closely to the pole that only 12½ feet of the trench were left unopened.

This particular ditcher was used in Miami, Florida, for opening gas main trench.

Besides cutting costs and saving time through quick and efficient handling, Barber-Greene Ditchers have walked through some exceptionally hard digging.

Another Barber-Greene Ditcher in Orlando, Florida, trenched 14,687 lineal feet of ditch in 21 days, and two hours. These figures average to 699 feet per day.

This digging story is substantiated by results in practically every section of the United States.

If you desire greater digging speed and efficiency—if your costs are running rather high with present methods—if you must finish a contract in a short space of time—you might be interested in our booklet, *Modern Ditch Digging*.

It shows how a number of companies have definitely "licked" such digging problems. A copy will be sent you upon request.

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Portable Belt Conveyors — Self Feeding Bucket Loaders

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*Union Water Meter Co., Worcester, Mass.
Buffalo Meter Co., Buffalo, N. Y.
Federal Meter Co., Brooklyn, N. Y.
Gamon Meter Co., Newark, N. J.
Hersey Mfg. Co., Boston, Mass.
National Meter Co., New York.
Thomson Meter Co., Brooklyn, N. Y.
Worthington Pump & Mchy. Corp., New York.

METERS, WATER (VENTURI TYPE)
Builders Iron Foundry, Providence, R. I.
Simplex Valve & Meter Co., Philadelphia, Pa.

MIXERS, CONCRETE (See Concrete Mixers)

MIXERS, GROUT
*American Cement Mchy. Co., Inc., Keokuk, Ia.
*Lakewood Engineering Co., Cleveland, O.
Kent Machine Co., Kent, O.
Union Iron Works, Inc., Hoboken, N. J.

MIXERS, HOT
*Barber Asphalt Co., Philadelphia, Pa.
*Koehring Co., Milwaukee, Wis.
Austin Machinery Corp'n, Muskegon, Mich.

MIXERS, MORTAR
*American Cement Mchy. Co., Inc., Keokuk, Ia.
*Blaw-Knox Co., Pittsburgh, Pa.
*Construction Machinery Co., Waterloo, Ia.
*Lakewood Engineering Co., Cleveland, O.
*Smith Co., T. L., Milwaukee, Wis.
Austin Machinery Corp'n, Muskegon, Mich.
C. H. & E. Manufacturing Co., Milwaukee, Wi
Kent Machine Co., Kent, O.
Knickerbocker Co., Jackson, Mich.
Lansing Co., Lansing, Mich.
Marsh-Capron Co., Chicago, Ill.
Ransome Concrete Mchy. Co., Dunellen, N. J.

MOTORCYCLES
Ace Motor Corp., Philadelphia, Pa.
Cleveland Motorcycle Co., Cleveland, Ohio.
Excelsior Motor Mfg. & Supply Co., Chicago, Ill.
Harley-Davidson Motor Co., Milwaukee, Wis.
Indian Motocycle Co., Springfield, Mass.

MOTORS, ELECTRIC (See Electric Generators and Motors)

MOTORS, GASOLINE
*Climax Engineering Co., Clinton, Iowa
*Hinckley Motors, Inc., Detroit, Mich.
Buda Co., Harvey, Ill.
Continental Motors Corp., Detroit, Mich.
Waukesha Motor Co., Waukesha, Wis.
Wisconsin Motor Mfg. Co., Milwaukee, Wis.

MOTOR TRUCKS
*Ford Motor Co., Detroit, Mich.
*General Motors Truck Co., Pontiac, Mich.
*International Motor Co., New York.
*United Motor Products Co., Grand Rapids, Mich.
Acme Motor Truck Co., Cadillac, Mich.
Atterbury Motor Car Co., Buffalo, N. Y.
Autocar Co., Ardmore, Pa.
Bessemer Motor Truck Co., Grove City, Pa.
Brockway Motor Truck Co., Cortland, N. Y.
Clydesdale Motor Truck Co., Clyde, O.
Denby Motor Truck Co., Detroit, Mich.

15 YEARS
of Making BESTS Better

IT'S long concentration on a high ideal that has made Best Tractors so successful on difficult jobs all over the world. Fifteen years have been spent in making the *Best* better—cutting down the weight, increasing the power, improving the balance, and, in general, developing tractors which will do more work with less toil, and better work at less cost.

The most convincing testimony of satisfied users of Best "Sixties" and "Thirties" is available to you on request—also complete catalog.

INVESTIGATE—it will pay you

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Dealers throughout the United States

BEST TRACTORS

10-125

Diamond T. Motor Car Co., Chicago, Ill.
Duplex Truck Co., Lansing, Mich.
Federal Motor Truck Co., Detroit, Mich.
Four Wheel Drive Auto Co., Clintonville, Wis.
Garford Motor Truck Co., Lima, O.
Gramm Bernstein Truck Corp'n, Lima, O.
The Hug Co., Highland, Ill.
Indiana Truck Corp'n., Marion, Ind.
International Harvester Co., Chicago, Ill.
Kelly Springfield Motor Truck Co., Springfield, O.
Kissel Motor Car Co., Hartford, Wis.
Larrabee-Deyo Motor Tr. Co., Binghamton, N. Y.
Nash Motors Co., Kenosha, Wis.
Pierce-Arrow Motor Car Co., Buffalo, N. Y.
Republic Motor Truck Co., Alma, Mich.
Service Motor Truck Co., Wabash, Ind.
Sterling Motor Truck Co., Milwaukee, Wis.
Stewart Motor Copr'n, Buffalo, N. Y.
Traffic Motor Truck Co., St. Louis, Mo.
Transport Truck Co., Mt. Pleasant, Mich.
U. S. Motor Truck Co., Cincinnati, O.
White Co., Cleveland, Ohio.

MOULDS, CONCRETE

*Blaw Knox Co., Pittsburgh, Pa.
*Raber & Lang Mfg. Co., Kendallville, Ind.

MUCKING MACHINES

Hear Shovel Co., Duluth, Minn.

NUMBERS, HOUSE (See "House Numbers")

OAKUM

Wall Rope Works, Beverly, N. J.

OILS, ROAD

*Barber Asphalt Co., Philadelphia, Pa.
*Barrett Co., New York.
*Standard Oil Co., (Indiana), Chicago, Ill.
*Texas Company, New York.
Atlantic Refining & Asphalt Corp'n, Philadelphia
Headley Good Roads Co., Philadelphia, Pa.
Pioneer Asphalt Co., Lawrenceville, Ill.
Standard Oil Co., (La.) New Orleans, La.
Standard Oil Co., (N. J.), Newark, N. J.
Standard Oil Co. (N. Y.), New York.

OXY-ACETYLENE APPARATUS

Oxweld Acetylene Co., Newark, N. J.

OXYGEN

Linde Air Products Co., New York.

PACKING, WATER PIPE

*Union Water Meter Co., Worcester, Mass.
Leadite Co., The, Philadelphia, Pa.
United Lead Company, New York.

PAINT GUNS

Spray Painting & Finishing Equipment Sales Co., Boston, Mass.

PAINTS, METAL PROTECTION

*Barber Asphalt Co., Philadelphia, Pa.
*Barrett Co., New York.
*Carey Co., Philip, Cincinnati, Ohio.
*Dixon Crucible Co., Jos., Jersey City, N. J.
*Solvay Process Co., New York
Acme White Ld. & Col. Works, Detroit, Mich.
Berry Bros., Detroit, Mich.
Cook Paint & Varnish Co., Kansas City, Mo.
Detroit Graphite Co., Detroit, Mich.
Detroit White Lead Wks., Detroit, Mich.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Minwax Co., New York.
Protexol Corpn., New York.
Ruberoid Co., New York.
Sherwin-Williams Co., Cleveland, O.
Sonneborn Sons, Inc., L., New York.
Toch Bros., New York.
Tropical Paint & Oil Co., Cleveland, Ohio.
Truscon Laboratories, Detroit, Mich.

PAPERS, BLUE PRINT AND BROWN PRINT

Indianapolis Blue Print & Supply Co., Indianapolis, Ind.

PAPER, BUILDING, ROOFING, ETC.

*Barber Asphalt Co., Philadelphia, Pa.
*Barrett Co., New York.
*Carey Co., Philip, Cincinnati, Ohio.
Bird & Son, inc., E. Walpole, Mass.
Brown Co., Portland, Me.
Hydrex Asphalt Products Corp., New York.
Johns-Manville, Inc., New York.
National Roofing Co., Tonawanda, N. Y.
Ruberoid Co., New York.

PARK BENCHES

*Stewart Iron Works Co., Cincinnati, O.
Art Concrete Works, Pasadena, Calif.
Bausman Mfg. Co., Millersville, Pa.
Dow Co., Louisville, Ky.
Meyers Mfg. Co., Fred J., Hamilton, Ohio.
Mott Iron Wks., J. L., New York.

PAVING AND ROAD ROLLERS. (See Road and Paving Rollers)

PAVING BLOCKS, CREOSOTED WOOD

America Creosote Wks., Inc., New Orleans, La.
Carter Bloxonend Flooring Co., Kansas City, Mo.
Creosoted Materials Co., New Orleans, La.
Republic Creosoting Co., Indianapolis, Ind.
Wyckoff Pipe & Creosoting Co., New York.

PAVING BRICK

Albion Shale Brick Co., Albion, Ill.
Alton Brick Co., Alton, Ill.
Barr Clay Co., Streator, Ill.
Bighamton Brick Co., Binghamton, N. Y.
Burton Townsend Co., Zanesville, N. Y.
Cleveland Brick & Clay Co., Cleveland, O.
Clydesdale Brick & Stone Co., Pittsburgh, Pa.
Coffeyville Vit. Brick & Tile Co., Coffeyville, Kans.
Corry Brick & Tile Corp., Corry, Pa.
Flint Brick Co., Des Moines, Ia.
Francis Vit. Brick Co., Boynton, Okla.
Georgia Brick & Tile Co., Adairsville, Ga.
Hammond Fire Brick Co., Fairmont, W. Va.
Hooking Valley Brick Co., Columbus, O.
Hydraulic Press Brick Co., St. Louis, Mo.
Independence Pav. Br. Co., Independence, Kans.
McAvoy Vit. Brick Co., Philadelphia, Pa.
Mack Mfg. Co., Wheeling, W. Va.
Mayer Brick Co., C. P., Bridgeville, Pa.
Medal Paving Brick Co., Cleveland, O.
Metropolitan Paving Brick Co., Canton, O.
Mineral Wells Pav. Brick Co., Mineral Wells, Tx.
Moberly Paving Brick Co., Moberly, Mo.
Murphysboro Paving Brick Co., Murphysboro, Ill.
Patton Clay Mfg. Co., Patton, Pa.
Peebles Brick Co., Portsmouth, O.
Penna. Clay Co., Pittsburgh, Pa.
Pittsburgh Paving Brick Co., Pittsburgh, Kans.
Poston Paving Brick Co., Crawfordsville, Ind.
Purington Paving Brick Co., Galesburg, Ill.
Southern Clay Mfg. Co., Chattanooga, Tenn.
Springfield Paving Brick Co., Springfield, Ill.
Sterling Brick Co., Olean, N. Y.
Streator Clay Mfg. Co., Streator, Ill.
Thornton Fire Brick Co., Clarksburg, W. Va.
Thurber Brick Co., Thurber, Texas.
Toronto Fire Clay Co., Toronto, Ohio.
Trinidad Brick & Tile Co., Trinidad, Ohio.
Veedersburg Paver Co., Veedersburg, Ind.
Western Clay Mfg. Co., Helena, Mont.
Westport Paving Brick Co., Westport, Md.

PAVING MACHINERY. (See Road and Paving Machinery)

PAVING GUARDS, STEEL

Godwin Co., W. S., Baltimore, Md.

PAVING MATERIALS. (See "Asphalt," "Paving Brick," "Granite Block," etc.)

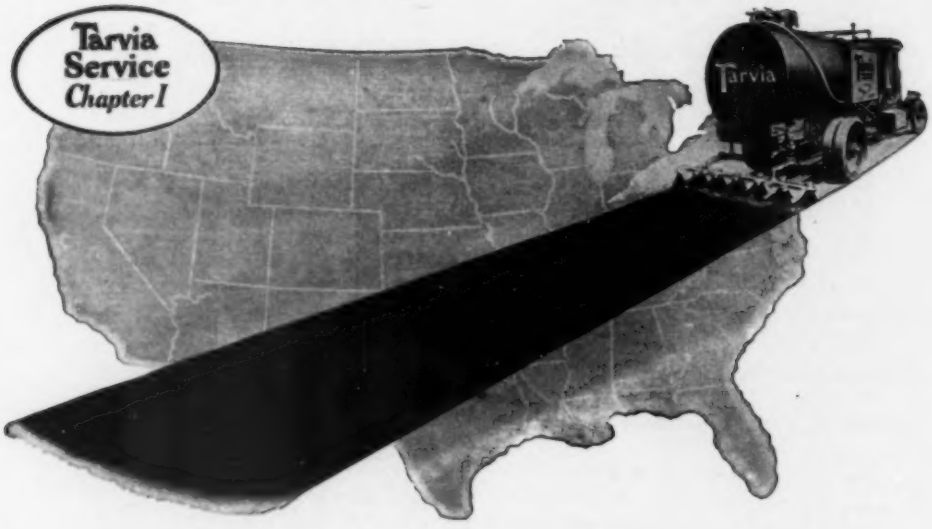
PAVING MIXERS. (See Concrete Mixers)

PAVING TOOLS

*Barber Asphalt Co., Philadelphia, Pa.
*Connery & Co., Inc., Philadelphia, Pa.
*Littleford Bros. Co., Cincinnati, O.
*Warren Bros. Co., Boston, Mass.
Acroil Burner Co., Union Hill, N. J.
Anderson Tool & Sup. Co., W. H., Detroit, Mich.
Cummer & Sons Co., F. D., Cleveland, O.
Union Iron Works, Hoboken, N. J.

PERFORATED METALS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Hendrick Mfg. Co., Carbondale, Pa.



The "Why" of Tarvia Service—

FOR many years these two things have caused much favorable comment: (1) The dependable precision of Tarvia delivery service; (2) The unvarying quality of Tarvia. Explanation is simple:

Barrett plants strategically located throughout the country insure "on-the-dot" delivery and production in quantities to meet any demand.

In every plant uniformly high quality of the product is assured by strict laboratory control. Plant laboratories are checked by the central Research Department of The Barrett Company. In every plant shipments are made on a carefully checked schedule—whether in tank-cars, tank-trucks, tank-wagons, barges or barrels. In brief—

You get Tarvia where you want it, how you want it—and when you want it.

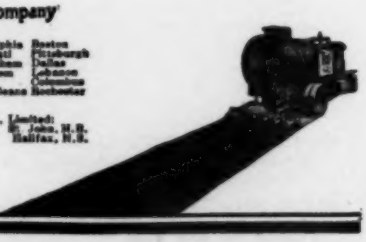
Tarvia
For Road Construction Repair and Maintenance

The Barrett Company

New York	Chicago	Philadelphia	Boston
St. Louis	Cleveland	Cincinnati	Pittsburgh
Detroit	Kansas City	Birmingham	Dallas
Minneapolis	Salt Lake City	Bethlehem	Johnstown
Youngstown	Milwaukee	Toledo	Columbus
Baltimore	Syracuse	New Orleans	Rochester

In Canada:
THE BARRETT COMPANY, Limited:

Montreal	Toronto	St. John, N.B.
Winnipeg	Vancouver	Halifax, N.S.



PICKS

Beall Tool Co., East Alton, Ill.
Hubbard Co., Pittsburgh, Pa.
Iron City Tool Works, Pittsburgh, Pa.
Klein-Logan Co., Pittsburgh, Pa.
Verona Tool Works, Verona, Pa.
Warren Tool & Forge Co., Warren, O.
Warwood Tool Co., Wheeling, W. Va.
Wyoming Shovel Wks., Wyoming, Pa.

PILE DRIVERS

*Clyde Iron Works Sales Co., Duluth, Minn.
*Industrial Works, Bay City, Mich.
*McKiernan-Terry Drill Co., New York.
Browning Co., Cleveland, O.
Lidgerwood Manufacturing Co., New York.
Mead-Morrison Mfg. Co., E. Boston, Mass.
McMyler Interstate Co., Cleveland, O.
Union Iron Works, Hoboken, N. J.

PILE HAMMERS, STEAM

*Clyde Iron Works Sales Co., Duluth, Minn.
*Industrial Works, Bay City, Mich.
*McKiernan-Terry Drill Co., New York.
National Hoisting Eng. Co., Harrison, N. J.
Union Iron Works, Hoboken, N. J.
Vulcan Iron Works, Chicago, Ill.

PILING, CONCRETE

MacArthur Concrete Pile & Foundation Co., N. Y.
Raymond Concrete Pile Co., New York.

PILING, INTERLOCKING STEEL

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Jones & Laughlin Steel Co., Pittsburgh, Pa.

PIPE, CAST IRON

*Central Foundry Co., New York.
*National Cast Iron Pipe Co., Birmingham, Ala.
*U. S. Cast Iron Pipe & Fdy. Co., Burlington, N. J.
American Cast Iron Pipe Co., Birmingham, Ala.
Clow & Sons, J. B., Chicago, Ill.
Donaldson Iron Co., Emans, Pa.
Fox & Co., John, New York.
Glamorgan Pipe & Fdry. Co., Lynchburg, Va.
Lynchburg Foundry Co., Lynchburg, Va.
Warren Fdry. & Machine Co., New York.
Wood & Co., R. D., Philadelphia, Pa.

PIPE, CULVERT. (See Culverts)

PIPE, LEAD

United Lead Company, New York.

PIPE, REINFORCED CONCRETE

Concrete Products Co., Pittsburgh, Pa.
Core Joint Concrete Pipe Co., Baltimore, Md.
Independent Concrete Pipe Co., Indianapolis, Ind.
Lock Joint Pipe Co., E. Orange, N. J.
Massey Concrete Products Corp'n, Chicago, Ill.
Newark Concrete Pipe Co., Newark, N. J.

PIPE, RIVETED STEEL

*Blaw-Knox Co., Pittsburgh, Pa.
*Connery & Co., Inc., Philadelphia, Pa.
*Littleford Bros., Cincinnati, Ohio.
Abendroth & Root Mfg. Co., Newburgh, N. Y.
American Spiral Pipe Works, Chicago, Ill.
Canton Culvert & Silo Co., Canton, O.
Chatta. Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago, Ill.
East Jersey Pipe Co., New York.
Hammond Iron Works, Warren, Pa.
Hardesty Mfg. Co., R., Denver, Colo.
Honhorst Co., Jos., Cincinnati, Ohio.
Lancaster Iron Works, Lancaster, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Tippet & Wood, Phillipsburg, N. J.
Welter Mfg. Co., Chicago, Ill.

PIPE, SPIRAL RIVETED

Abendroth & Root Mfg. Co., Newburgh, N. Y.
American Spiral Pipe Works, Chicago, Ill.

PIPE, STEEL

Central Tube Co., Pittsburgh, Pa.
East Jersey Pipe Co., New York.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Spang-Chalfont & Co., Pittsburgh, Pa.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE, WOOD

American Wood Pipe Co., Tacoma, Wash.
Continental Pipe Mfg. Co., Seattle, Wash.
Michigan Pipe Co., Bay City, Mich.
Pacific Tank & Pipe Co., San Francisco, Cal.
Redwood Mfrs. Co., San Francisco, Cal.
Standard Wood Pipe Co., Williamsport, Pa.
Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE, WROUGHT IRON

Byers Co., A. M., Pittsburgh, Pa.
Reading Iron Co., Reading, Pa.

PIPE BENDING MACHINES

Amer. Pipe Bending Mach. Co., Boston, Mass.
Walworth Mfg. Co., Boston, Mass.

PIPE COVERING

AIRCELL

*Carey Co., Philip, Cincinnati, Ohio.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Johns-Manville, Inc., New York.
Keasbey & Mattison Co., Ambler, Pa.
Nat'l Asbestos Co., Jersey City, N. J.
Norristown Mag. & Ash. Co., Norristown, Pa.
Sall Mt. Co., Chicago, Ill.
Watson Co., H. F., Erie, Pa.

85 PER CENT MAGNESIA

*Carey Co., Philip, Cincinnati, Ohio.
Ehret Magnesia Co., Valley Forge, Pa.
Johns-Manville, Inc., New York.
Keasbey & Mattison Co., Ambler, Pa.

WOOD

Continental Pipe Mfg. Co., Seattle, Wash.
Redwood Mfrs. Co., San Francisco, Cal.
Rie-Wil Co., Cleveland, O.
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE CUTTERS. (See Cutters, Pipe, Hand.)

PIPE FITTINGS

*Central Foundry Co., New York.
*Nat'l Cast Iron Pipe Co., Birmingham, Ala.
*U. S. Cast Iron Pipe & Fdry. Co., Burlington, N. J.
American C. I. Pipe Co., Birmingham, Ala.
Builders Iron Fdry., Providence, R. I.
Clow & Sons, J. B., Chicago, Ill.
Crane Co., Chicago, Ill.
Lunkenheimer Co., Cincinnati, O.
Reading Steel Casting Co., Inc., Bridgeport, Conn
Warren Fdry. & Mach. Co., New York.
Wood & Co., R. D., Philadelphia, Pa.

PIPE HANDLING MACHINERY

Mueller Company, Decatur, Ill.
Taylor Portable Steel Derrick Co., Chicago, Ill.

PIPE JOINT COMPOUND. (Sewer)

*Carey Co., Philip, Cincinnati, Ohio.
*Waring-Underwood Co., Philadelphia, Pa.
G. K. Sales Co., Macungie, Pa.
Leadite Company, Inc., Philadelphia, Pa.
Pacific Flush Tank Co., Chicago, Ill.
Ruberoid Co., New York.

PIPE JOINT MATERIAL. (Cast Iron)

Lead-Hydro-Tite Co., Boston, Mass.
Leadite Co., The, Philadelphia, Pa.
United Lead Co., New York.

PLAYGROUND APPARATUS

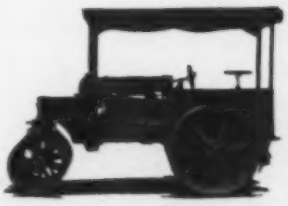
American Playground Device Co., Anderson, Ind.
Everwear Mfg. Co., Springfield, O.
Exerswing Co., Minneapolis, Minn.
George, Howard, Philadelphia, Pa.
Hill-Standard Co., Anderson, Ind.
Medart Mfg. Co., Fred., St. Louis, Mo.
Patterson, Williams Co., San Jose, Calif.
Spalding & Bros., A. G., Chicopee, Mass.

PLOWS, CONTRACTORS

*Austin-Western Rd. Mach. Co., Chicago, Ill.
*Burch Plow Works Co., Crestline, O.
*Holt Mfg. Co., Peoria, Ill.
*Russell Grader Mfg. Co., Minneapolis, Minn.
Adams & Co., J. D., Indianapolis, Ind.

Road ACME Machinery

REGISTERED TRADE MARK.



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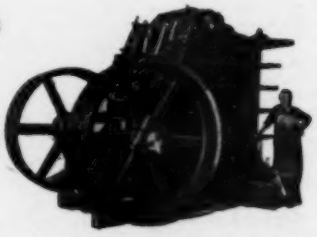

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Acme rollers, crushers, elevators, screens, graders, wagons and other equipment have proven the best by actual test. Years of continuous service testify to the efficiency and economy of operation. As pioneers of the all-steel frame crusher and of the four cylinder gasoline roller—we have been given a prestige that is enjoyed by few and the confidence which the public has in machinery bearing the ACME trade mark is a real reward.

Acme Road Machinery Co., Inc.

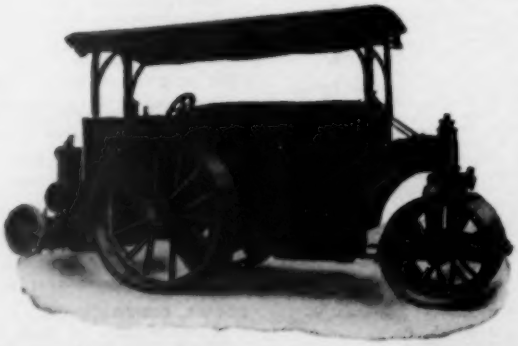
Frankfort, N. Y.

ROLLERS

Three-wheeled
gasoline
steam
Tandem

CRUSHERS

Primary
Secondary
Stationary
Portable



Bins
Conveyors
Elevators
Graders
Mixers
Pulverizers
Screens
Sprinklers
Sweepers
Wagons

American Steel Scraper Co., Sidney, O.
Deere & Co., Moline, Ill.
International Harvester Co., Chicago, Ill.
Moline Plow Co., Rock Island, Ill.
Oliver Chilled Plow Works, South Bend, Ind.
Sidney Steel Scraper Co., Sidney, O.
Slusser-McLean Scraper Co., Sidney, O.
Smith & Sons Mfg. Co., Kansas City, Mo.
Western Wheeled Scraper Co., Aurora, Ill.
Wiard Plow Co., Batavia, N. Y.

PLUMBING SUPPLIES

Clow & Sons, J. B., Chicago, Ill.
Crane Co., Chicago, Ill.
Glauber Brass Mfg. Co., Cleveland, O.
Mott Iron Wks., J. L., New York.
Mueller Company, Decatur, Ill.
Randle-Spence Mfg. Co., Milwaukee, Wis.
United Brass Mfg. Co., Cleveland, O.
Walworth Mfg. Co., Boston, Mass.

POLES, STEEL STRUCTURAL

*Blaw-Knox Co., Pittsburgh, Pa.
Electric Railway Equipment Co., Cincinnati, O.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.

PORTABLE BUILDINGS

*Blaw-Knox Co., Pittsburgh, Pa.
*Littlisford Bros., Cincinnati, Ohio.
*Truscon Steel Co., Youngstown, O.
Kolb Building Co., New York.
Milwaukee Corrugating Co., Milwaukee, Wis.

PORTABLE STEEL DERRICKS. (See Derricks, Steel Portable.)

PORTLAND CEMENT. (See Cement.)

POWDER. (See Explosives.)

POWER PLANTS, INDUSTRIAL

*Climax Engineering Co., Clinton, Iowa
*Turner & Moore Mfg. Co., Detroit, Mich

PUMPS, AIR LIFT

*American Steam Pump Co., Battle Creek, Mich.
Harris Air Pump Co., Indianapolis, Ind.
Indiana Air Pump Co., Indianapolis, Ind.
Ingersoll-Rand Co., New York.
Sullivan Machinery Co., Chicago, Ill.

PUMPS, BOILER FEED

*American Steam Pump Co., Battle Creek, Mich.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Aurora Pump & Mfg. Co., Aurora, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Steam Pump Co., Buffalo, N. Y.
Cameron Steam Pump Works, A. S., New York
Dayton-Dowd Co., Quincy, Ill.
Dean Bros. Co., Indianapolis, Ind.
De Laval Steam Turbine Co., Trenton, N. J.
Deming Co., Salem, O.
Fairbanks, Morse & Co., Chicago, Ill.
Gardner Governor Co., Quincy, Ill.
Goulds Mfg. Co., Seneca Falls, N. Y.
Indiana Air Pump Co., Indianapolis, Ind.
LeCourtenay Co., Newark, N. J.
Morris Machine Works, Baldwinsville, N. Y.
Murray Iron Works Co., Burlington, Ia.
Northern Fire Apparatus Co., Minneapolis, Minn.
Rumsey Pump Co., Seneca Falls, N. Y.
Scranton Pump Co., Scranton, Pa.
Union Steam Pump Co., Battle Creek, Mich.
Vogt Bros. Mfg. Co., Louisville, Ky.
Warren Steam Pump Co., Warren, Mass.
Weinman Pump Mfg. Co., Columbus, O.
Yeomans Bros. Co., Chicago, Ill.

PUMPS, CENTRIFUGAL

*American Steam Pump Co., Battle Creek, Mich.
*Domestic Engine & Pump Co., Shippensburg, Pa.
*Keystone Driller Co., Beaver Falls, Pa.
*Nove Engine Co., Lansing, Mich.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Well Works, Aurora, Ill.
Aurora Pump & Mfg. Co., Aurora, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Cameron Steam Pump Works, A. S., New York.
Dayton-Dowd Co., Quincy, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Erie Pump & Engine Works, Medina, N. Y.
Fairbanks, Morse & Co., Chicago, Ill.
Goulds Mfg. Co., Seneca Falls, N. Y.
Indiana Air Pump Co., Indianapolis, Ind.
LeCourtenay Co., Newark, N. J.
Manistee Iron Wks., Manistee, Mich.
Morris Machine Works, Baldwinsville, N. Y.
Rumsey Pump Co., Seneca Falls, N. Y.
Schramm, Inc., West Chester, Pa.
Tekheim Oil Tank & Pump Co., Ft. Wayne, Ind.
United Iron Works, Inc., Kansas City, Mo.
Wheeler Condenser & Eng. Co., Carteret, N. J.
Worthington Pump & Mchy. Corp., New York.
Yeomans Bros. Co., Chicago, Ill.

PUMPS, CONTRACTORS'

*American Steam Pump Co., Battle Creek, Mich.
*Construction Mach'y Co., Waterloo, Ia.
*Domestic Engine & Pump Co., Shippensburg, Pa.
*Kinney Mfg. Co., Boston, Mass.
*Smith Co., T. L., Milwaukee, Wis.
*Standard Scale & Supply Co., Pittsburgh, Pa.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Well Works, Aurora, Ill.
Aurora Pump & Mfg. Co., Aurora, Ill.
Barnes Mfg. Co., Mansfield, O.
Buda Co., Harvey, Ill.
Cameron Steam Pump Works, A. S., New York.
Carter Co., Ralph B., New York.
C. H. & E. Manufacturing Co., Milwaukee, Wis.
Dayton-Dowd Co., Quincy, Ill.
Deming Co., Salem, Ohio.
Emerson Pump & Valve Co., Alexandria, Va.
Erie Pump & Engine Works, Medina, N. Y.
Fairbanks, Morse & Co., Chicago, Ill.
Goulds Mfg. Co., Seneca Falls, N. Y.
LeCourtenay Co., Newark, N. J.
McGowan Co., J. H., Cincinnati, O.
Morris Machine Works, Baldwinsville, N. Y.
Myers & Bro. Co., F. E., Ashland, O.
Northern Fire App. Co., Minneapolis, Minn.
Nove Engine Co., Lansing, Mich.
Pulsometer Steam Pump Co., New York.
Rumsey Pump Co., Seneca Falls, N. Y.
Schramm, Inc., West Chester, Pa.
Van Nouhuys Machine Wks., Albany, N. Y.
Waldo Bros. & Bond Co., Boston, Mass.

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*American Steam Pump Co., Battle Creek, Mich.
*Domestic Engine & Pump Co., Shippensburg, Pa.
*Keystone Driller Co., Beaver Falls, Pa.
American Well Works, Aurora, Ill.
Cameron Steam Pump Works, A. S., New York.
Clark Co., H. W., Mattoon, Ill.
Cook, Inc., A. D., Lawrenceburg, Ind.
Deming Co., Salem, O.
Fairbanks, Morse & Co., Chicago, Ill.
Goulds Mfg. Co., Seneca Falls, N. Y.
Harris Air Pump Co., Indianapolis, Ind.
Indiana Air Pump Co., Indianapolis, Ind.
Layne & Bowler Co., Memphis, Tenn.
McDonald Mfg. Co., A. Y., Dubuque, Ia.
Midwest Engine Co., Indianapolis, Ind.
Myers & Bro. Co., F. E., Ashland, O.
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United Iron Works, Inc., Kansas City, Mo.
Weber Subterranean Pump Co., New York.

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Ellicott Machine Corp., Baltimore, Md.
Erie Pump & Engine Co., Medina, N. Y.
Morris Machine Works, Baldwinsville, N. Y.
Worthington Pump & Mchy. Corp., New York.

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Gilbert & Barker Mfg. Co., Springfield, Mass.
Wayne Tank & Pump Co., Fort Wayne, Ind.

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American Well Works, Aurora, Ill.
Aurora Pump & Mfg. Co., Aurora, Ill.
Barnes Mfg. Co., Mansfield, O.
Dayton-Dowd Co., Quincy, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
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Domestic Engine & Pump Co., Shippensburg, Pa.
Evinrude Motor Co., Milwaukee, Wis.

*Indicates that the manufacturer carries an advertisement. See index listing inside back cover.

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is better than ever prepared to assist the ROAD BUILDERS of 1925

That BETTER ROADS may be built at LOWER COST—Blaw-Knox Company has developed and perfected *time* and *labor* saving equipment which is being used on hundreds of Road Jobs in every state in the Union.

The Blaw-Knox line of ROAD BUILDING EQUIPMENT is bigger, better and more comprehensive than ever before.

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Self-clearing, hopper-bottom steel bins for the storage of sand and stone, and quick loading of trucks, etc., with accurately measured batches.

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Made of ¼" steel with wide bottom flange. A never-failing lock joint we can't have made of heavy plate.

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A complete line of clamshell buckets—for any digging or re-handling work, and for any crane.

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The quick, accurate and labor saving method for measuring sand and stone. Furnished with the Batcherplant—or can be installed on any steel or wooden bin.

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Standard, all-steel buildings of any size for the housing of men, materials and equipment. Weatherproof and fire-safe.

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Visit our Exhibit at the *Road Show* in Chicago—Jan. 3rd to 9th, 1925.

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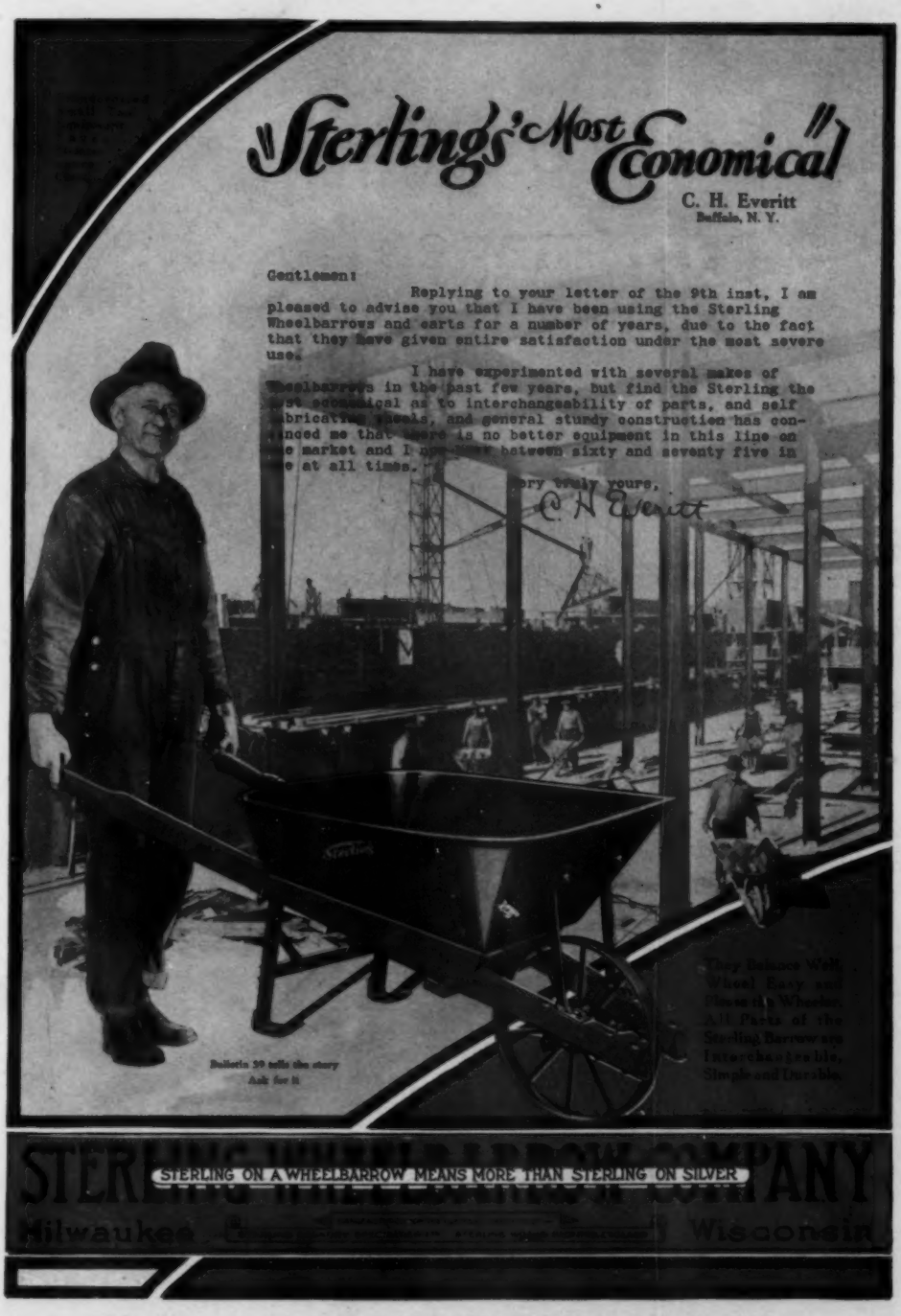
ROAD BUILDING EQUIPMENT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C. H. Everitt
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Gentlemen:
Replying to your letter of the 9th inst, I am pleased to advise you that I have been using the Sterling Wheelbarrows and carts for a number of years, due to the fact that they have given entire satisfaction under the most severe use.
I have experimented with several makes of Wheelbarrows in the past few years, but find the Sterling the most economical as to interchangeability of parts, and self lubricating spools, and general sturdy construction has convinced me that there is no better equipment in this line on the market and I operate between sixty and seventy five in use at all times.
Very truly yours,
C H Everitt
Bulletin 39 tells the story
Ask for it
They Balance Well
Wheel Easy and
Dump the Wheelbarrow
All Parts of the
Sterling Barrow are
Interchangeable,
Simple and Durable
STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER
Milwaukee
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Successful Road Building Depends on Paver Performance

Never in the History of Highway Construction Has There Been Greater Evidence of Fine Paver Performance Than That Given by the "Smith" During the Last Year.

Below—21-E Smith Paver owned by John Edelman—used on Michigan State Highway job.

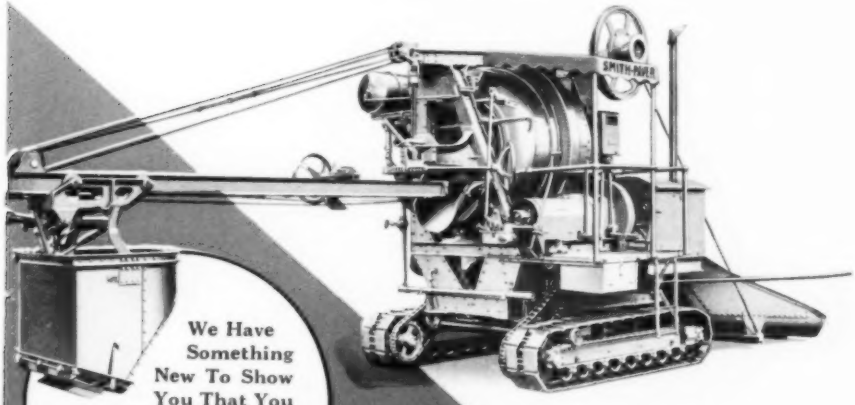
Center—On one of Chicago's busiest corners—Michigan and Jackson Blvds., paver owned by American Asphalt Paving Co.

Above—"Smith" owned by McConn Const. Co., Noblesville, Ind.

From one end of the country to the other, letter after letter has come to us expressing satisfaction over the splendid production records made with Smith Pavers. Road Contractors on big city jobs and on county and state highways who have used a Smith all tell us that the work of the Smith is unequalled.

In point of maximum production, speedy mixing and discharging, low operating and *low maintenance costs*, there is no other paver that compares with the Smith.

SMITH PAVERS



Smith 21-E Paver—lowest overall height, speediest and most economically operated paver ever made.

We Have Something New To Show You That You Can't Afford To Miss.

On Exhibition at the coming Road Show

Center—Smith 21-E Paver owned by Oswald Bros., Los Angeles, Calif. This paver gained from 5 to 8% a day over a competitive paver used on the same job at the same time.

Below—One of two Smith Pavers owned by John A. Mercier Co., Detroit, Mich.

Its low overall height—lower now than ever before, its traction, its drum with the famous and exclusive Smith end-to-center mixing action, its powerful frame, its "one-man control"—all are features that make Smith the outstanding quality paver.

Let us tell you in detail about the "Smith." Full information is contained in our Catalog 409E—a copy of which will be promptly sent you upon request.

THE T. L. SMITH COMPANY

1030 32d St., Milwaukee, Wis.

Branch Offices and Service Stations in all Principal Cities

SMITH PAVERS

Russell Portable Gravel Plant

Screens Crushes and Loads

all in one operation–

One handling of material performs all three operations—screening, crushing and loading. Conveys all the material from gravel pit, screens, crushes and delivers a uniform product directly into wagon, truck or bin.

The feed back principal to crusher makes all material uniform—no oversize can pass the screen. Hopper arrangement and wide 24 inch delivery conveyor affords rapid loading of trucks.

Construction of this outfit is most substantial and durable insuring steady service and long life. Weight complete 28,500 pounds.

The complete Russell Line includes—**8 Sizes Road Machines, 2 Sizes Elevating Graders, Maintenance Patrol Machines for both Motor and Horse Power, Scarifiers, Road Drags and Wheel Scrapers, Drag Lines, Gravel Screening, Crushing and Loading Equipment, Steel Beam Bridges, etc.**

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Dependable Ford Power Transports and Operates This Sturdy, Portable Archer Speedmobile

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Stationary Concrete Mixers
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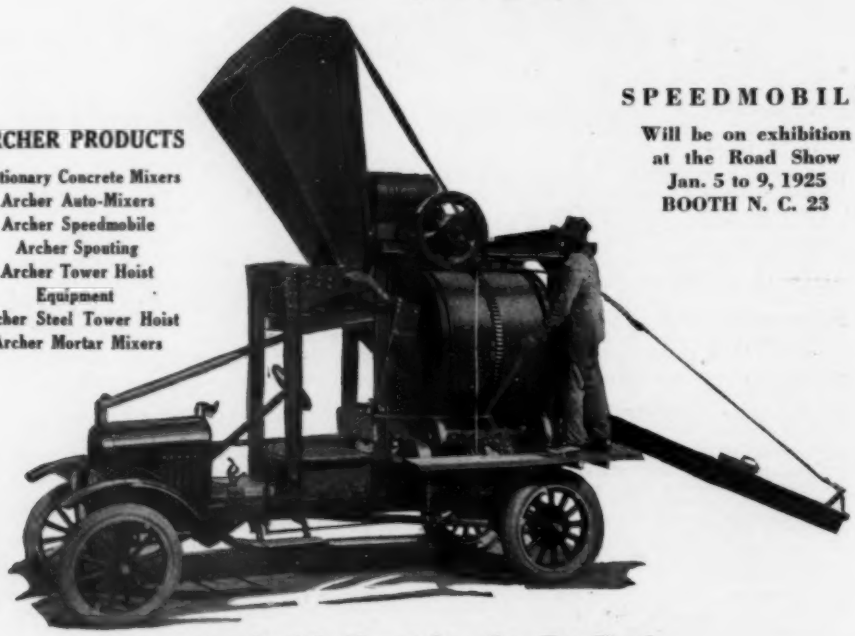
Will be on exhibition at the Road Show Jan. 5 to 9, 1925 BOOTH N. C. 23



Speedmobile Mounted on One Ton Truck

THE profitable operation of your concrete equipment depends upon two things—(1) speed and economy in moving it from job to job, or to different locations on the same job; (2) dependable, economical uninterrupted power for its operation.

YOU get both in a single unit with this time-saving, money-making, Archer Speedmobile; that unit is your Ford engine. It makes your mixer as flexible in its movements as the Ford itself, and you know that a Ford will go anywhere. This combination is an exclusive feature, protected by Archer patents, but you pay no "premium" for its use. You simply pay for the Mixer equipment, plus the chassis or truck on which it is mounted; or if you have a truck of your own we will sell you the mixer equipment only and make the installation for you.

THE patented Archer power take-off transmits the power of the engine to the mixing equipment and automatically operates the loading skip, giving at all times a smooth flow of dependable power that insures greater service and longer life for the equipment.

Investigate the Archer Speedmobile before you buy; it represents an investment that will pay you handsome dividends. *Shall we send you catalog?*

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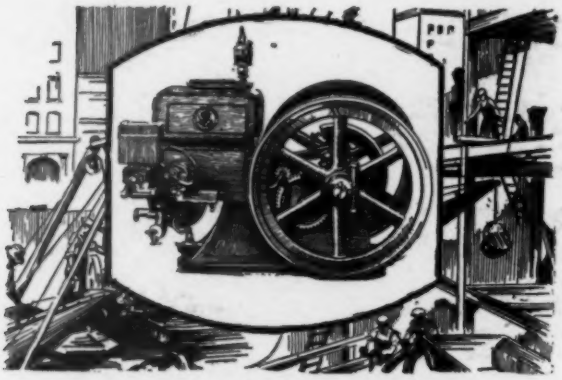

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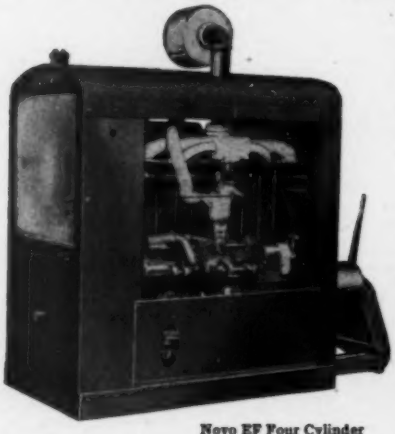

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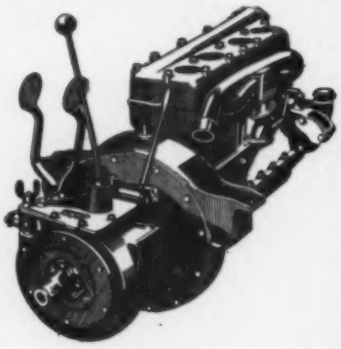

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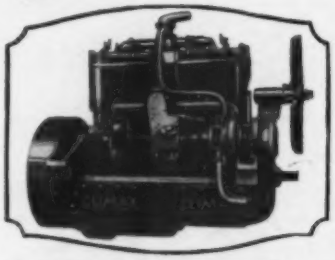

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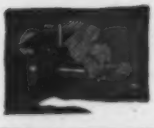

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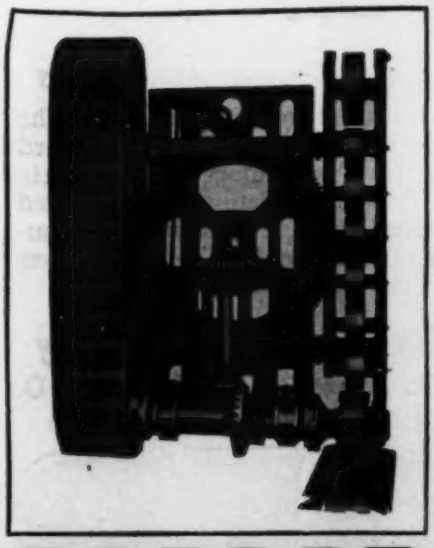

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Building the New Gandy Bridge Between St. Petersburg and Tampa, Florida

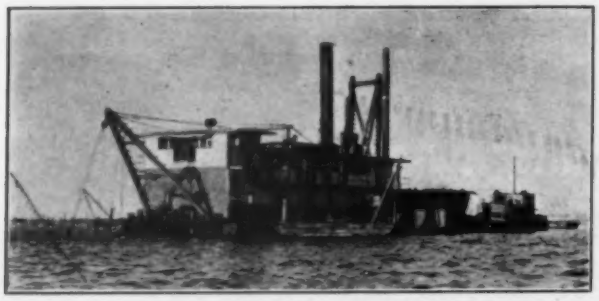
Longest Automobile Toll Bridge in the World Cost $3,000,000

THE $3,000,000 Gandy bridge and causeway between St. Petersburg and Tampa, Fla., across Old Tampa Bay is nearly 6 miles long. The completion of the building of this bridge is the result of an idea of George S. Gandy, a resident of St. Petersburg, whose life has been spent in the promotion, construction and operation of public utilities. The project was financed with local capital, securities having been sold to residents and winter visitors of St. Petersburg and Tampa and near-by sections of Florida. The bridge was built by the Bay Construction Company, of St. Petersburg. The structure is in three parts. Two long sand-fill causeways jut out from either shore of the bay and are connected by a section of reinforced concrete bridge which spans the deeper waters of the middle of the bay. The west causeway is more than 12,000 feet long, the concrete bridge section 13,629 feet, and the east causeway approximately 4,500 feet long. The causeways are sand-filled 10 feet above mean low water along the center line and slope to a width of 400 feet at the water line. The deep water ends of the fills are protected by concrete sheet-pile bulkheads.

SECTION OF THE 2½-MILE TEMPORARY CONSTRUCTION RAILROAD BUILT TO BRING MATERIALS TO THE SITE OF THE GANDY BRIDGE

TABLE MADE OF BOILER PLATE, AND FOUR AIR BRAKES TAKEN FROM FREIGHT CARS, USED TO BEND REINFORCING STEEL

The concrete bridge is 24 feet clear width on the road surface, which is from 11 to 20 feet above mean low water. A steel double-bascule drawbridge spans the main channel of the eastern part of the bay, giving a clear opening of 75 feet. The entire structure is illuminated from shore to shore by General Electric highway units upon 30-foot tubular steel poles



STEAM DREDGE TUSCAWILLA AT WORK THROWING UP SAND FOR THE CAUSEWAY

spaced about 300 feet. The concrete bridge design is by the Raymond Concrete Pipe Company, and the drawbridge was designed by the Strauss Bascule Bridge Company. The Seaboard Dredging Company, of Jacksonville, carried out the the subcontract of dredging the long causeways.

During the two years of construction, 2,000 men were employed in the work and 2,000,500 cubic yards of sand were dredged from the bottom of Old Tampa Bay for the causeways. In the concrete bridge 170,000 bags of Atlas portland cement, 30,000 tons of gravel, and 15,000 tons of sand were used, and the other principal materials included 1,500,000 feet of lumber, 3,500 tons of steel, 7,000 tons of rock, 1,125,000 brick, 75,000 feet of electric cable, and 50,000 feet of water pipe. The construction equipment consumed 40,000 gallons of gasoline, 30,000 gallons of fuel oil, 2,500 tons of coal, and 9,000 gallons of lubricating oil. More than 1,600 cars of equipment and materials were delivered to the site of the work, in addition to a heavy tonnage by barge and motor truck.

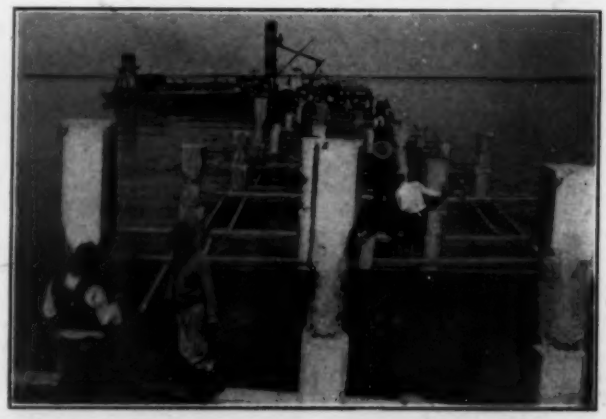
Progress of Construction

The first step taken toward actual construction of the Gandy bridge and causeways was in the spring of 1915, when George S. Gandy engaged a corps of engineers to project survey lines across Old Tampa Bay under the direction of C. E. Burleson, who is now engineer for Pinellas County. The object of the surveys was to run several lines across the bay to discover the shortest bridge line with the least amount of deep water. Additional surveys were made between 1915 and 1922, when more detailed studies were made of the bottom of the bay. Some soundings were taken across the broad shoals which extend from either shore of the bay, and it was learned that these flats contained sufficient sand for dredging purposes, which made it possible to create the long sand-filled causeways from the shores to the deeper water in the middle of the bay. Over these sand flats there is an average depth of water of little more than one foot.

In the middle of the bay a broad bed of rocks was discovered, the eastern half of which was covered by an overburden of sand several feet deep. Upon this natural rock foundation it was decided to erect a concrete bridge. This deeper water across the middle of the bay showed an average depth of 10½ feet, with a maximum depth of 23 feet in the main channel, where the drawbridge now stands.

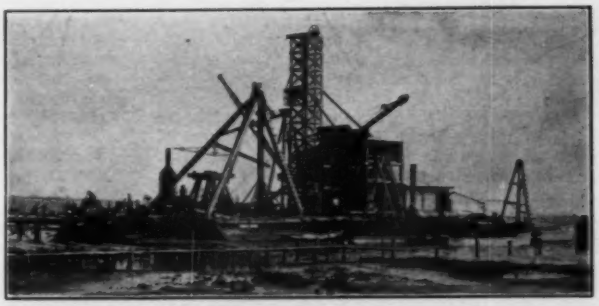
During the World War a small amount of filling and grading was done within temporary bulkheads, but it was impossible to carry on major operations. Following the close of the war, there was a period of high-priced material markets and national conditions which were adverse to the financing of the project.

In the early fall of 1922 the job was undertaken in earnest by the Bay Construction Company of St. Petersburg, and work has been carried on unceasingly for two years. A subcontract for dredging for the long causeways was let to the Seaboard Dredging Company of Jacksonville, whose dredge "Tuscawilla" pumped the first sand to form the Pinellas causeway on September 26, 1922. The dredge "Florida" commenced operations on the Hillsboro causeway in November of that year and was joined in the work by the dredge "Reliable" in March, 1923. Dredging operations were carried on continuously for more than a year and a half. The fleet of dredges first threw up a ridge of sand along the line to a height just above high water and then worked back over the line and brought the causeways up to an elevation of 10 feet above mean low water, which is above the height of the hurricane tide of 1921. The causeways slope from the roadway in the center to the beaches. They are 400 feet wide at the base, and the aggregate length of both causeways is nearly 3½ miles. The eastern or Hillsboro causeway is three-quarters of a mile long, and the western or



CUTTING OFF CONCRETE PILES ON THE GANDY BRIDGE BY HAND

Pinellas causeway is nearly 2½ miles long. Approximately 2,500,000 cubic yards of sand was dredged for these causeways.



THE LARGE FLOATING CONCRETE PLANT WHICH CAPSIZED IN THE STORM IN MARCH, 1924

The Construction Camp

Late in 1922 a large construction camp was established on the eastern shore of the bay in preparation for the building of the concrete bridge to span the middle of the bay. The camp, named "Ganbridge," was complete in the spring of 1923. Several acres of land were cleared and drained, miles of adjoining county highways were repaired, and temporary roads were built for the transportation of men and materials between Tampa and the site of the work. A 2½-mile construction railroad was laid which gave the camp rail connections with the Atlantic Coast Line-Port Tampa Line and with deep water at the end of the eastern causeway fill, where an 1,100-foot pier was built for the transportation and handling of materials and bridge parts.

More than a dozen buildings were erected for the camp, with an aggregate floor space of 20,000 square feet. Comfortable dormitories and bath-houses were erected for workmen at the south end of the camp. In the center of Ganbridge, a large warehouse, offices, woodworking machine and blacksmith shops were built. Along the north side of the camp a large concrete-pile-casting plant and yards were constructed. A water-softening and filtering plant, water, power, light and telephone lines and a sewerage system were installed. A large assortment of various kinds of construction equipment was shipped into Ganbridge from Tampa, Jacksonville, Philadelphia, St. Paul, Chicago, New Orleans and elsewhere.

Concrete Work

A large floating concrete plant and a smaller one were assembled on barges moored to small docks along the beach. A quadruple pile driver and a quadruple drilling outfit were also assembled. Various barges, boats and pieces of stationary equipment were built and assembled for special work in the construction of the concrete bridge.

In the spring of 1923 Ganbridge was a particularly active place. A force of 500 men and a miscellaneous collection of cranes, derricks, locomotives, pile-drivers, motor trucks, concrete mixers, tugboats, tractors, drilling outfits, dredges and workshops were in action. A heavy tonnage of cement, sand and steel rolled into the camp, and large cargoes of gravel and lumber were unloaded at the pier out of barges from Mobile and New Orleans.

The first concrete of the bridge was poured at the pile-casting plant on May 15, 1923. The big plant had been completed and the concrete flowed into the forms. This was the occasion for a big celebration. Workmen laid down their tools, and all the whistles on the job screamed amid the sharp staccato of firearms. After months of preparation, the hundreds of workmen welcomed the sight of Gandy bridge concrete.

The concrete plant continued the manufacture of piles until October, 1923, and completed 2,400 reinforced piles in this time. The piles are 16 inches square and from 20 to 60 feet in length. Each batch of concrete was subjected to rigid tests in a laboratory at the camp. This was worth while as shown by the fact that later the piles were easily handled by the cranes and driven by steam hammers into the bottom of the bay with little difficulty and no breakage. After the piles were cast, they were cured for a month in the pile yard and then were picked up by locomotive cranes and removed to the storage space on the eastern causeway, from where they were later transported by railroad and barge to the middle of the bay and placed on the line of the bridge.

VIEW OF THE GANDY BRIDGE UNDER CONSTRUCTION, SHOWING CONCRETE CAPS AND FIRST ASSEMBLY OF FLOOR OF DECK FORMS IN FOREGROUND

Drilling and Pile-Driving Operations

During this period of the work at Ganbridge two floating drill barges of the Layne Southeastern Company were drilling the rock bottom of the bay at all points along the bridge line to determine whether the bed of rock was a

solid mass or merely a thin crust. Holes were drilled by rotary drills in the rock to a minimum depth of 11 feet at distances of 150 feet along the line, and in no place was the rock penetrated.

The first pile was driven into the bay bottom in July, 1923. In the eastern part of the bay, piles were driven through sand to the rock. Some of the piles penetrated sand to a depth of 45 feet. The large quadruple pile driver placed four piles at a time by the use of water jets and steam hammers, insuring correct alignment.

In the western part of the bay where the rock bottom was not covered by an overburden of sand, the piles were placed in drill holes made by a quadruple drill barge. These piles were set in the rock to a depth of 5 feet or more.

The piles were placed in the bay in groups of four spaced 5 feet between centers across the line of the bridge, and the bents were spaced 24 feet apart along the bridge line. They were aligned and braced by timbers, then cut off to proper levels by several methods. Hand tools, air tools and explosives were used at the various stages of the work. The reinforcing rods in the piles were cut with acetylene torches. Owing to the quality of the concrete and the fact that the work was done over water in all kinds of weather, the cutting-off operation was tedious work.

After the piles had been placed, aligned and cut off, wood forms for the concrete caps were clamped in place. Reinforcing steel was placed in the forms from barges, and the smaller of the two floating concrete plants poured the caps which bind each bent of piles into a rigid unit.

Constructing the Roadway

The next operation was the placing of heavy wood and steel forms for the concrete deck beams and slabs. These were floated in place on barges and raised to position by specially designed screw-jacks. After a large crew of carpenters had completed the assembly and made the several parts of the deck forms tight, an intricate network of reinforcing steel was wired in place in the forms, around which concrete was poured by the large floating plant. The last deck span was cast in July, 1924.

In the bridge deck the slab or top surface and supporting beams were cast integral in units of eight spans, or a length of 192 feet between expansion joints which prevent the bridge from breaking under the strain of expansion caused by changes in temperature. Examination of these joints when a chilly northwest storm blows over the bay after a warm day in winter shows that it would expand as much as 5 feet were it not for the 70-odd expansion joints in its length. As it is, the deck beams slide the fraction of an inch upon steel plates at each expansion joint when severe changes in temperature occur.

The concrete bridge is 2½ miles long and 24 feet wide between curbs. Along each curb line of the bridge is a substantial reinforced concrete railing for the protection of vehicles. This work, which consumed six months' time, was completed in September, 1924, with more than 3,500 posts and twice that number of rails along the sides of the bridge.

The Draw-Span

Over the main channel near the eastern end of the bridge is the steel double-bascule draw-bridge with a clear opening of 75 feet for the passage of ships. The foundation method of draw-spans consists of eight reinforced concrete cylinders 5 feet in diameter set in the rock bottom of the bay and topped with heavy blocks of concrete. The draw-span is electrically operated. The fabrication and erection of the Strauss bascule draw-span was done under subcontract by the Tampa Shipbuilding and Engineering Company, of Tampa.

Tulsa's New Water-Supply

The Spavinaw Project in Pictures in Our February Issue

ON October 19 the last length of concrete pipe was laid in Tulsa's big Spavinaw pipe line. This completed 55½ miles of 60- and 54-inch concrete conduit from Spavinaw Lake in the Ozarks to the storage reservoir outside the city. This project, which cost $7,500,000 was finished in almost exactly two years from the letting of contracts. Approximately 50 per cent of the contract for the manufacture and laying of the concrete pipe was completed in the last nine months, since the time when the Walbridge-Aldinger Company abandoned its contract and the Water Commission took over the work, to be finished under the direction of its Engineer, W. R. Holway. This project, which cost $7,500,000, was finished in river crossings, and it was on the bank of the Grand River, the most troublesome of these rivers, that the last pipe was laid. On November 17 the city celebrated the turning of the water into her mains and rejoiced in the possession of one of the best water-supplies in the Southwest.

We are indebted to W. R. Holway, Chief Engineer of the Spavinaw project, for the interesting group of progress photographs which, with descriptive captions, will appear in the February, 1925, issue of CONTRACTORS' & ENGINEERS' MONTHLY. These photographs trace the work from the construction of Spavinaw dam down the pipe line to Tiawah tunnel, the Verdigris plant of the Lock Joint Pipe Company, the Verdigris tunnel, Mohawk Reservoir and Mohawk pumping-station. The different methods of construction are shown very clearly.

1924 Building Conditions

The summary of 1924 building operations and the prospects for 1925 will appear in the February issue of CONTRACTORS' & ENGINEERS' MONTHLY.

Contractor Must Have All Facts to Bid

Right of Contractor to Recover Damages for Misrepresentations Made to Him of Character of Material to Be Excavated

By Leslie Childs
Attorney

GENERALLY speaking, a contractor has the right to rely upon the representations of an owner relative to the character of material to be excavated. In particular is this true where the owner has made such representations for the purpose of inducing bids; and, if the representations are made with knowledge that they are untrue, the contractor suffering loss thereby will, as a general rule, have an action for damages against the other.

The application of this rule of law is illustrated in a most striking and interesting manner in the recent New York case of Jackson vs. State, 205 N. Y. S. 658. The facts and circumstances which culminated in the action were, in so far as material here, as follows:

Bid Based on Representations of State in Respect to Material

In this case the contractor entered a bid for a unit price to construct a certain section of a canal for the state of New York. The bid was predicated on information given by the state that the material to be excavated consisted of "sand, sand and clay, sand and gravel, red sand, black sand, gravel filling rock, sand and stone."

When the work was entered upon, however, it developed that the material to be removed was harp-pan, or a hard, compact material, which materially increased the cost over what it would have been had the material been as represented by the state. Following the completion of the contract, the contractor brought the instant action against the state for damages for the increased cost of the work.

Upon the trial of the case, it was in evidence that the state had not given out all the information it had relative to the kind of material to be removed when bids were requested. The evidence showed that at that time the state had information that showed the material to be excavated was "hard and firmly compacted"; that this information was not divulged, and that the bid was asked for on the representation that the material to be handled was soft and easily excavated.

On this statement of facts, the Court, in discussing the question of whether or not the state had been guilty of fraud, in part said:

State Misrepresented Material

"The state, with knowledge that the material to be excavated was 'a hard, compact mass' of the nature of hard-pan, difficult and expensive to excavate, represented on the plans upon which the * * * bid was based that the material consisted of sand, sand and clay, sand and gravel, red sand, black sand, gravel filling rock, sand and stone.' The material shown on the plans would be easy to excavate, and much less expensive than the material found.

"The finding of fact discloses that the state, knowing the material to be excavated consisted of a 'hard, compact mass,' represented by its plans that it consisted of an entirely different kind of material, one which would be easy to excavate. It takes no argument to demonstrate that such conduct on the part of an individual would constitute misrepresentation and fraud. It was more than a failure to state all the facts in the state's possession. It was a representation of a fact entirely contrary to the actual fact known by the state when the representation was made. * * *

But, the state seems to have contended that under clause 10 of the contract it was relieved from all liability of this kind under the contract. The clause in question provided:

"The contractor agrees that he has satisfied himself by his own investigation and research regarding all the conditions affecting the work to be done and labor and material needed, and that his conclusion to execute this contract is based on such investigation and research, and not on the estimate of the quantities or other information prepared by the state engineer, and that he shall make no claim against the state because any of the estimates, tests or representations of any kind affecting the work made by an officer or agent of the state may prove to be in any respect erroneous."

In holding that the above stipulation in the contract would not protect the state, under the facts as disclosed by the evidence, the Court, among other things, said:

Contractor Held Entitled to Damages

"A party to a contract cannot, by misrepresentation of a material fact, induce the other party to the contract to enter into it to his damage, and then protect himself from the legal effect of such misrepresentation by inserting in the contract a clause to the effect that he is not to be held liable for the misrepresentation which induced the other party to enter into the contract. * * *

"It may be conceded that paragraph 10 of the contract would afford protection to the state on a claim for damages because of an innocent mistake in the plans upon which bids were received. If the state had believed the material to be excavated was as indicated * * * and had not had in its possession other information which disclosed that the material was different than shown * * *, then there might not be any liability on the part of the state, because the material actually found was different than the state, upon all the information which it had and disclosed, honestly believed it to be. * * *

"In the instant case there are specific findings of fact that the state disclosed part of its information indicating that the material to be excavated was easy to excavate, but suppressed the fact that its investigations indicated that the material to be excavated consisted of a hard, compact mass, a great deal more expensive to excavate. It

represented by its plans one condition, when it had information of an entirely different condition.
* * * *"

Conclusion

In conclusion, the Court rendered judgment in favor of the contractor, holding, as outlined in the opinion, that the state would not be permitted to take advantage of a misrepresentation that was made in the face of a knowledge of the truth; and further, that the state could not escape liability by setting up a provision of the contract that it should not be responsible for erroneous statements in its plans.

The foregoing New York decision is obviously one of force and value on the points decided. It fairly illustrates the application of the rule of law that holds one liable for wilful misrepresentations of facts in situations of this kind. Truly the case is one of importance to contractors and engineers in general, and its facts and holding may with profit be had in mind when situations similar to the one reviewed are encountered.

The Value of Quantity Surveys

By A. W. Young
Universal Engineering Company, Bridgeport, Conn.

WHAT would you think of a man who offered to do $100,000 worth of work for $90,000? He is not a philanthropist, because such a man would do the work gratis. He has made a mistake or is unreliable.

Being closely connected with the building trade, we hear of such cases almost daily. For example, only recently six contractors bid on a certain project, five of whom submitted prices varying only slightly. The sixth contractor was low by $9,000, and we know that the others figured on a very close margin of profit. In this particular instance, the first five contractors have built up strong organizations during the years that they have been in business, are financially in good standing, and have earned a reputation for integrity and satisfactory work. The low bidder has been in business a comparatively short time, has erected only one building of any size, and within a year after its completion the construction was found to be faulty. The owners are dissatisfied, but it is too late to change.

Does it always pay to give a job to the lowest bidder? Innumerable instances can be cited to prove that it does not. It is undoubtedly better to give the work to a contractor of good repute than to save a few thousand dollars in first cost and lose years in service of the building.

There are reasons for differences in prices of bids. The contractor, in listing his quantities, may make a hurried survey and allow amounts that he knows are only approximately right. He believes that if his prices are found to be too low during the course of construction, he can make up the loss by cutting on quality of materials and in hasty construction, thus saving on costs. If he guesses too far from the correct amounts, he will have to go out of business, and in any case the owner is the loser.

One of the chief reasons for inconsistent estimates is that contractors are seldom given sufficient time for the proper preparation of bids. They are expected to understand thoroughly in a few days the drawings that an architect has taken months to prepare and apparently no thought is ever given to the time necessary for the contractors to take off their quantities and make up their estimates.

There are a number of organizations in this country known as quantity surveyors who are doing a great service for the building industry—doing it in a quiet, but efficient, manner, with little cooperation on the part of architects or engineers, and very often in the face of strong opposition from them. Owners throughout the country have saved considerable sums of money through the employment of quantity surveyors.

Quantity surveyors, the same as architects and engineers, are trained men in their profession. They have had years of practical experience in the making and reading of plans and specifications and in outside field management. In making a quantity survey, every item of material and labor application necessary for the proper construction of the building is listed. This work is checked and rechecked so that it is improbable that mistakes will occur.

A quantity survey when received by a contractor is an exact statement of material quantities, making the preparation of his bid a matter of hours instead of weeks. He has only to price these items of material and labor application, add his percentage of profit, and submit his bid with the knowledge that neither he nor the owner is going to lose. In short, a quantity survey eliminates guesswork and gambling on the part of the contractor; it eliminates the great expense of contractors' estimates; it eliminates extra work; and it eliminates the need for contractors' contingency funds. But, most important, it places all bids on a uniform basis. All bids are made from the same quantities, and no great differences should occur. This makes it impossible for the unreliable low bidder to become a dangerous factor. There would be no such thing as competitive bidding of quantities. Certain quantities of materials are needed for every building, and all bids would be made on the basis of those quantities listed in the quantity survey. On the job mentioned in this article, two contractors bid on the basis of a uniform survey with a variation of less than ½ per cent in their bids, while the difference between the high and low bidders was 47½ per cent without the use of a uniform survey.

The owner should insist upon the including of a quantity survey with the plans and specifications to the contractor. This would produce cooperation and harmony between all interested parties, from the owner to the subcontractors. Each person's responsibility would be definitely established, and the probability of litigation would be almost entirely eliminated. The owner or his representative would not be able to make unreasonable demands on the contractor, and the contractor would be paid for the actual amount of work done by him—no more and no less.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting fields may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt, consult your own lawyer

Edited by A. L. H. Street, Attorney-at-Law

Effect of Errors in Estimates on Which Bids Are Made

In the case of Palmberg vs. City of Astoria, 228 Pacific Reporter, 107, decided by the Oregon Supreme Court, plaintiff sued to recover damages resulting, it was claimed, from an error of defendant in materially understating in specifications the quantity of embankment required to complete a street improvement. Plaintiff claimed that he was thereby induced to place a lower bid than would have been placed except for such mistake. Ruling against the validity of the claim, the Oregon Supreme Court said, in part:

"In City of Richmond v. Smith, . . . 89 S. E. 123, it was held that the word 'approximate' written on a profile of the river over which a bridge was to be built meant 'substantially accurate,' but in that case there was no stipulation as in the case at bar that 'no claim shall be made against the city on account of any excess or deficiency.' In the annotations to the instant case in 16 A. L. R. 1125, it is said:

" 'Where, however, it is expressly understood and agreed by the parties that the estimates are approximate only, the city will not be liable for any mistake in the estimates.' "

Agreed Damages for Delay in Completing Buildings

It is a well-established rule of law that a provision in a contract for payment of a stated sum as damages for breach of the contract will not be enforced where it manifestly exceeds the actual damage and where the actual loss is subject to ascertainment with reasonable certainty. Such provisions are designated in the law as "penalties." But clauses stipulating damages are enforced as properly providing liquidated damages, where they have proper relation to the actual loss or where the actual loss cannot be determined.

Recognizing this distinction, the West Virginia Supreme Court of Appeals lately sustained the validity of a provision in a hotel building contract for a payment by the contractor of $25 for each day's delay in completing the structure after the date agreed upon for completion. (Parke vs. Pence Springs Company, 118 Southeastern Reporter, 508.) The official syllabus indicates that the decision was to some extent influenced by the fact that the contract also provided a bonus of $25 per day in favor of the contractor for each day's time saved under the contract date for completing the hotel. But the opinion puts the decision on a ground thus stated:

"In this particular case there is no satisfactory or known rule by which damages for failure to complete the work contemplated by the contract . . . could be ascertained. . . . We therefore conclude that the $25 per day for failure to complete this building within the time fixed by the contract is for liquidated damages."

Contractor's Responsibility for Collapse Due to Soil Conditions

Where a foundation gives way because of the nature of the underlying soil, causing the superstructure to fall, the contractor is not responsible, according to the view taken by the Louisiana Supreme Court in the case of A. M. Blodgett Construction Company vs. Cheney Lumber Company, 57 Southern Reporter, 369. In that case, defendant unsuccessfully resisted liability for a balance due on the agreed price for constructing a dam on account of a collapse of the structure. The Supreme Court said, in part:

"The following is part of an entry appearing in the transcript: 'Defendant formally abandons the allegation that the concrete foundation was not built or constructed to the depth required or provided for in the contract, plans and specifications.'

"If the dam gave way because of the action of the water below the concrete, there is evidence . . . that the wreckage and destruction of this foundation was due to the 'utter insufficiency of the soil foundation, on which the works rested; and, second, the failure of the Blodgett Company to construct the works according to contract.'

"If the foundation was unsafe, if it was quicksand or blue mud, [a] kind of soapstone, selected by all parties concerned, the works as performed by the Blodgett Company do not appear to have been the cause. The bottom having given way, the top had to fall, and the fall cannot, in the presence of the testimony, be charged to those who constructed the top under the facts and circumstances."

Right to Avoid Signed Contract

What the St. Louis Court of Appeals decided concerning the binding effect of a personal injury claim release in the case of Fisher vs. Webb-Kunze Construction Company, 263 Southwestern Reporter, 1022, applies to contracts in general. It was held that it is a well-established general rule that an adult, in possession of his faculties, able and having opportunity to read an instrument signed by him, will not be permitted to avoid the effect of his signed obligations on the ground that he did not know what was in the contract, so far as this lack of knowledge is due to his own fault or negligence. But where one is ignorant and unable to read, or but slightly versed in the language in which the paper is drawn, or is intoxicated or otherwise dispossessed of his faculties, and is overreached by the other party, he may avoid the contract on the ground of fraud.

In the cited case plaintiff was held to be entitled to avoid a release of liability on account of an injury sustained in the course of his employment, on the ground that an insurance company had obtained the release under misrepresentations that it was a mere receipt for insurance benefits.

Damages for Delay in Giving Possession of Building

The following brief opinion handed down by the Appellate Term of the New York Supreme Court in the case of Kraut vs. Schenkin, 205 New York Supplement, 546, may be regarded as stating good law covering a case where it is sought to hold a building contractor liable for delay in completing a store building:

"Damages based on rental value and measured by such loss of store use, whether of the entire store or only part, as directly results from the delay, should have been considered. . . . Necessity for employing a helper before the actual opening, or for keeping him idle, was not shown, and upon the record presented the sum paid the helper was not an element of damage."

Owner's Responsibility Toward Contractor's Employees

In a case involving the liability of defendant for fatal accident to an employee through ignition of gas in a condenser tank which was being erected (Frymyer vs. Kaw Boiler Works, 227 Pacific Reporter, 453) the Oklahoma Supreme Court lately had occasion to lay down these rules of law as governing the liability of owners and independent contractors for injuries sustained by employees of the latter in the course of performing contracts with the former:

An owner employing an independent contractor will be liable, generally, to third persons for injuries resulting from the doing of the work, which are the natural and probable consequences of the usual methods of performing such work. The owner is not answerable for injuries resulting to third persons in the course of the work, which are the result of negligence of the contractor. The last-stated rule rests upon the principle that the owner has a right to rely upon a presumption that the contractor will discharge his legal duties to his employees and third persons.

Contractor's Duty to Safeguard Children Trespassing on Street Work

A paving contractor, to prevent travel upon newly constructed pavement, erected a barricade on the street, consisting in part of a two-horse dump-wagon. The wagon was not secured and small children set it in motion, resulting in the death of one of them. The Ohio Supreme Court decided in the case of De Groodt vs. Skrbina, 144 Northeastern Reporter, 601, that the circumstances were such as to warrant a jury in finding that the contractor was negligent, thereby rendering himself liable in damages. The Court said:

"The case presented for the determination of the jury was whether the contractor, with the knowledge of the danger that might ensue in permitting the dump-wagon to be unsecured in a locality where small children were continuously playing about, had exercised the care which ordinarily prudent men would have exercised under like circumstances. It may be conceded that the wagon was used as a part of the barricade by permission of the city authorities, but it must also be conceded that the lad had a lawful right to use the street. Although lawfully in the street, the courts divide upon the question whether a child becomes a trespasser by meddling with an instrumentality in the public street. But even if he be considered a trespasser, within the rule applied to private premises, if the contractor gained knowledge or information of the peril that might result to small children from the continued use of such instrumentality, a legal duty might arise which would require him to avoid that peril. In that respect, he would be required to act as reasonably prudent men act under like circumstances."

Sewer Contractor's Bond Did Not Cover Accident

A sewer construction contract, performance of the conditions of which was secured by bond, provided that "Any injury resulting to persons or to private or public property from . . . the negligence or misconduct on the part of the contractor, his agents, servants and employees in the prosecution of the work under his contract, must be repaired by the contractor and his bondsmen; and the damages caused thereby must be paid by such contractor and his bondsmen at their own expense."

Interpreting this provision in the light of other clauses in the contract, the Missouri Supreme Court decided in the case of Gerber vs. Kansas City, 263 Southwestern Reporter, 432, that it did not give a cause of action against the contractor's sureties on account of the death of a boy caused by the contractor's negligence in leaving a fuse with explosive cap attached on a pile of excavated earth, where it was found by the boy.

Contractor's Liability to Subcontractor for Causing Delay

A principal contract provided against any charge by the contractor for hindrances or delays. A subcontract made the provisions of the principal contract applicable so far as consistent, but required that the subcontractor complete the work by a certain time or pay damages. Under these conditions, the United States District Court for the District of Delaware held in the case of Walter R. Cliffe Company vs. Du Pont Engineering Company, 298 Federal Reporter, 649, that there was no implied agreement by the contractor to pay damages to the subcontractor for causing hindrance or delay. The Court said, in passing:

"To establish the existence of the asserted implied obligations of the defendant [contractor] the plaintiff [subcontractor] invokes the general rule of law that out of the covenant of a subcontractor to perform certain work by a particular day, or, in default, to pay to the contractor a sum of money as liquidated damages, there arises an implied obligation on the part of the contractor that the subcontractor shall not be hindered or delayed in the performance of his work by the contractor, and that for any breach thereof the contractor will pay damages. . . .

"The plaintiff concedes, however, that this rule may be 'made inapplicable by the express and peculiar provisions of the subcontract.' The plaintiff likewise concedes that, where a subcontractor undertakes to work according to the original contract with the owner, the two contracts form, in effect, but one contract, and that the subcontractor is entitled to the same benefits and bound by the same conditions as the contractor under the original contract, except in so far as the original contract is inconsistent with the subcontract."

Recent Road Construction in England

Middlesex County Road Work Helps Relieve London Traffic Congestion

By Ross Nebolsine

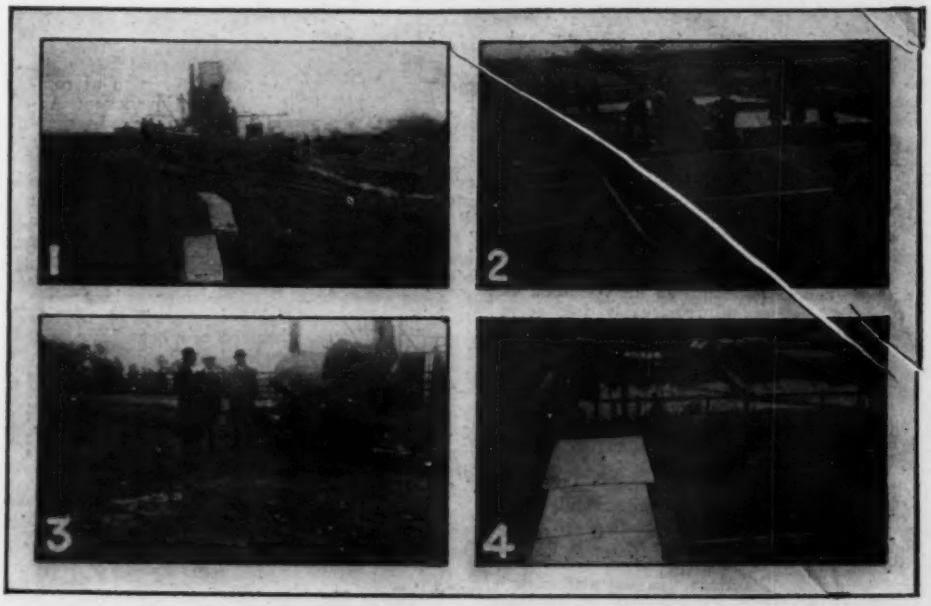
MODERN road building in England received a great impetus when the Road Board was created under "The Development and Road Improvement Fund" in 1909. The object and power of the Road Board was to assist the county councils and other highway authorities in the construction of new roads and the improvement of old ones. The Road Board could also act independently of local authorities in carrying out its work. The Road Improvement Fund is secured from gasoline or motor spirit taxes and motor car license fees. The funds at the disposal of the Road Board in 1910 amounted to about £1,000,000, which has increased to about £13,000,000 in 1924. By the Ministry of Transport Act, 1919, the Road Board was absorbed by the Ministry of Transportation.

To help relieve the unemployment situation, the Ministry encouraged immediate arterial road construction all over England by granting extensive subsidies to local authorities ranging from 50 to 75 per cent of the cost of construction. It was thought that these schemes would give work to a great number of unskilled workmen and laborers, but it was soon discovered that road building required skilled labor. Although not solving the unemployment question, this extensive road construction program did to some extent relieve the situation, at the same time giving England an excellent system of modern trunk roads.

Middlesex County Road Work

Middlesex County, situated northwest and west of London, was the first county to start road work, by building the North Circular Road, Western Avenue, Chertsey Road, and Great West Road. The total estimated cost of the new road construction amounts to over £3,500,000.

The original plan called for arterial roads with 100 feet right of way with two 24-foot roadways carrying traffic in each direction, with a 20-foot space in the center. This space may be developed later as a tramway or high-speed track for automobiles. Recently it has been generally recognized in England that tramways or trolley lines, because of their great interference with motor traffic and the high cost of construction, should not form a part of the roadway, but if economically justifiable should be constructed entirely separately on road-beds of their own.



SCENES ON THE GREAT WEST EXTENSION

1. Lakewood mixer in operation. 2. Pouring concrete in diagonal strips from cars pushed by hand. 3. Dinkey used to haul aggregate to mixer on 30-inch gage track. 4. View looking west over the Northumberland Canal, showing side walls of canal, which are above ground level

The Great West Road

Of these developments, the Great West Road is the most spectacular. It was designed before the war, by H. T. Wakelam, then County Engineer of Middlesex. In 1914 an Act of Parliament was

passed for its construction on the basis of 75 per cent grant from the Road Board. Special provisions in the act prohibited the laying of water-mains under the roadway and required that motor busses using the road should contribute ½d, or about one cent per car-mile. The war held up the construction of this road until 1920. The main purpose of the road is to by-pass the congested streets of Brantford and Hounslow, since the old London Road could not be economically widened. This new road will carry all of the through London traffic to and from the west. The first plans called for an 80-foot right of way with a 50-foot roadway and two 15-foot sidewalks, but this was changed through the efforts of A. Dryland, County Engineer of Middlesex, in 1921 to a 120-foot right of way between fences, with a 50-foot roadway, with the possibility of widening it eventually to 80 feet, and allowing space for two 20-foot paths. All water-mains were laid in duplicate under the footpaths and at crossings the mains were carried in subways. One such subway had to be made 33 feet wide to carry three large water-mains.

The type of road adopted was a subgrade of 12 inches of cinder or hard core, and a 9-inch foundation of reinforced concrete, with a 2-inch rock asphalt surfacing laid by the Limmer & Trinidad Lake Asphalt Company.

Concrete surfacing has only recently begun to be used in England. Asphaltic surfacing on concrete foundations is credited with the advantage of being free from cracks and better able to withstand heavy traffic. The methods of construction were to pour the foundation without expansion joints, in alternate diagonal strips each about 10 feet wide, to reduce cracks. When the concrete foundation has set, it is surfaced with 2 inches of rock asphalt in its natural state. The results seem to have been excellent, as the condition of the surface is good and remarkably free from waving.

On embankments, especially those of London clay, where the fill is likely to settle, only a temporary surfacing is laid. This consists of the usual 12-inch bed of cinders with a 4-inch surfacing of slag tar macadam. It is expected that in two or three years it will be possible to lay the permanent surfacing.

Where there is a chance of surface water's coming onto the road from adjoining land, intercepting blind drains are constructed near the boundary line of the right of way. The run-off for the roadway goes to catch-basins at the curb, spaced 100 to 300 feet apart. In one place where the road is perfectly straight and the natural grade only 1 in 2,000, artificial longitudinal grades were resorted to in order to dispose of the water more rapidly and at the same time not to increase the crown. At present the engineers consider that this artificial rise and fall of grade was not absolutely necessary, and it spoils the beauty of the road.

One of the striking features of most of the modern English arterial roadways is that they are confined by curbs of either granite or concrete. In the case of this road, they are 6 x 18-inch granite blocks laid in rather dry concrete ahead of the work. The tops of the curbs are 6 inches above the top of the pavement. The accuracy of alignment and curvature depends on the skill of the curb-layers, as the stakes are spaced infrequently on the center line of the road.

No Grade Crossings Permitted

The Great West Road is about 5 miles long and starts at Chiswick. It is connected in a bell-mouth junction with the Chiswick High Road at Gunnersbury Lane, which will shortly be widened to 100 feet and form part of the North Circular Road. This road required the construction of five bridges, three over railways, one under a railway, and one over the Grand Junction Canal, as there are to be no grade crossings. The bridge over the road carries a branch of the Great Western Railroad and was built so that traffic was not disturbed. The abutments were built in trenches, the tracks being temporarily supported by timbers while the steel truss was built alongside on wooden trestlework. On a Sunday it was pulled into position by hand winches, and was opened for traffic Monday morning. The soil between the abutments was excavated after the bridge was in place.

The western terminus of the road is at its junction with the historic Bath Road, first built by the Romans. At this point the Great West Extension begins.

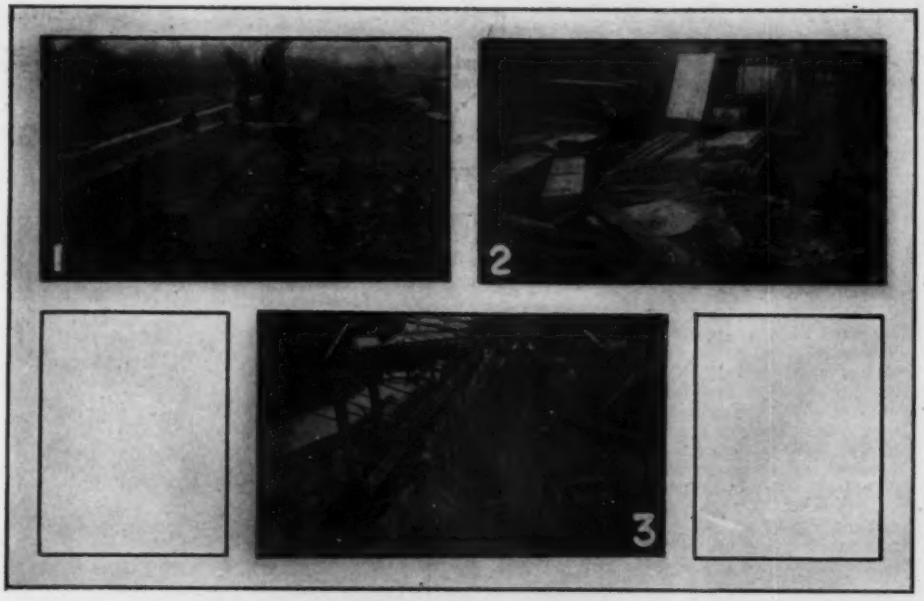
The execution of this work was helped by the Unemployed Relief Works Act of 1920, which permits forced acquisition of land, where necessary, on the expiration of 7 days' notice to the owners and tenants, leaving the question of compensation to be settled by the Government Appraiser with an appeal to arbitration. In practice, this method has worked out satisfactorily, as it makes prompt beginning of the work possible, and cases that had to go to arbitration formed an insignificant percentage. According to the Rent Restricture Act, alternate accommodations had to be provided for tenants, even though the property had been purchased. This has prevented the completion of the Great West Road, as a short section has yet to be built where some 40 houses are still located on the right of way. These will be torn down shortly when the new ones being built by the county are completed.

The total cost of the work, including purchase of the land, rehousing and other forms of compensation, is about £1,000,000, or approximately $900,000 per mile. The work was done by different contractors and also by force account. This stupendous cost is partly due to the extensive use of hand labor rather than machinery, as it was the express desire of the Government to employ as many laborers as possible, thus to check the great unemployment during 1920 and 1921.

The Great West Extension

The Great West Extension is a road a little over 3 miles long. This highway will connect the junction of the Great West and Bath Roads with the Staines and Basingstoke Roads, tapping the cross-river traffic and thus greatly increasing the usefulness of the Great West Road itself.

The right of way of this road is 100 feet with a 30-foot roadway and two 30-foot footpaths. The roadway is capable of being widened to 60 or 70 feet if necessary in the future. As mentioned before, until quite recently concrete roads were regarded with suspicion in England, as it was felt that the pounding of the steel-tired wheels of tractors, tractor engines and heavy horse trucks that are still quite common in England would destroy the surface very quickly. Another objection was the cracking of concrete road surface.



THE GREAT WEST EXTENSION, MIDDLESEX COUNTY

1. Laying granite curbs. 2. Reinforced concrete piles 6 x 18 inches broken in driving into "ironstone." 3. Trench and concrete sheet piling for west abutment wall of bridge over Northumberland Canal, showing reinforcement in place ready for concreting

The climate of England is on the whole milder and more humid than that of the United States, so that rapid changes of temperature are not common. In the clayey regions in England there is considerable movement of the subsoil, due to differences in the moisture content. Swelling in some cases has lifted the concrete slabs 4 inches. It was to investigate the performance, methods of construction, and maintenance of concrete roads that A. Dryland came to the United States in 1921 and spent five weeks touring eight eastern states and Canada. He was greatly impressed by the condition of the roads and the smoothness of the surface after years of traffic. As a result, a reinforced concrete road was decided upon, the idea being that if it was found unsuitable to English conditions, it would be of value, serving as a foundation to bituminous surfaces.

The methods of construction used are as follows: On a 6-inch subgrade of cinders, 6 inches of 1:2:4 concrete are poured in alternate diagonal bays. Sheets of light reinforcing are placed near the top. The concrete is thoroughly tamped, and immediately afterward a 2-inch wearing surface of 1:2:3 granite chip concrete is mixed and placed by hand. The surface is then screeded, giving a total thickness of 8 inches of concrete. A Lakewood mixer is used on this job, placed at the side of the roadway, and 30-inch gage dump-cars supply cement, sand and stone from central storage points and also carry the mixed concrete to the roadway. The omitted strips of concrete are poured two or three days later. It is claimed that this method of construction reduces cracking and allows slight movement of the slab in adjusting itself to temperature changes.

Bridges

Work is now being done on two bridges that will carry the road over canals. The first and larger canal was built by the Duke of Northumberland and the other by Cardinal Wolsey centuries ago to supply water to their estates. The level of the water in the canals is above that of the surrounding territory. This introduces rather a complicated construction and drainage problem. The first bridge will be a reinforced concrete arch structure. Trouble was encountered in building the abutment walls, as long wooden piles were out of the question for fear they would pierce the water-proof clay bottom of the canal or the walls and permit leakage. The water is at present used on the estates and for power purposes, though it has a fall of only 3 inches.

Short, heavy concrete sheet piling was driven, back of which trenches were excavated and the abutment walls constructed. The gravel, known as "ironstone," corresponding to hard-pan, through which it was neccessary to drive the piles, was so hard that 6 x 18-inch reinforced concrete sheet piles broke off like match sticks. Finally it was decided to brace the walls of the canal with light wood sheeting, then to excavate the trenches and slowly drive the concrete piling by undercutting. The reinforcing was then placed and the abutment walls built by pouring the concrete back of the piling into the trench.

The other bridge is a concrete box culvert and, being shorter, did not present such difficulties.

Conclusion

The costs and performance of this road will be carefully watched, as future extensive concrete

road building in England depends in part on the results obtained in the Great West Extension.

The author wishes to acknowledge and thank Alfred Dryland for his courtesy and help, and Mr. Miller, Associate Editor, *Roads and Road Construction*, London, Ernest Raylton and Percy Hancock, Engineers of Middlesex County, for their kindness and cooperation during the inspection of these English road projects this last summer.

Road Construction in Jackson County, Missouri

Contractor Uses Ruckstell-equipped Ford Truck for Heavy Hauling

ALL construction work in Missouri is now done under the supervision of the State Highway Commission. All specifications must be approved by the Commission and work is rigidly inspected as it progresses. When bids were asked for the construction of a section on the Sni-a-bar road in Jackson County, Mo., a number of contractors entered their bids. The job was awarded to the Ross Construction Company of Kansas City, which underbid all other contractors.

On this job, hauling was one of the chief problems. The hauling included carrying materials to the mixer as well as gravel from the pits, which were located at a considerable distance from the job. As soon as the contract had been awarded, the Ross Construction Company made a critical analysis of the hauling problem in line with the equipment available. This equipment included various makes of trucks, a number of which were 5-ton heavy haulage units. Mr. Ross made a thorough investigation of the possibility of using Ford trucks as supplementary equipment, as it was realized that in many parts of the job it would be difficult for the heavy units to operate efficiently, if at all. A thorough test of a Ford truck equipped with an Anthony body and a Ruckstell two-speed axle resulted in very interesting hauling figures, and an order was placed for twelve Ruckstell-equipped Ford trucks. Each truck has an Anthony body and a cushion seat. The man whose sole work is to supervise the service of the fleet has one assistant, and these two men are able to handle all of the service work efficiently after working hours.

HAISS SELF-FEEDING LOADER PILING DIRT INTO A FORD TRUCK EQUIPPED WITH RUCKSTELL AXLE AND ANTHONY AUTOMATIC LOW ROCKER DUMP BODY

From the very start the efficiency of these units became apparent and it was found that the trucks could haul 5,000 pounds on good roads and negotiate heavy pulling with far more than the rated tonnage. Where roads are good and speed is a factor, the installation of the high-speed worm in connection with the Ford axle gives a combination of 40 per cent greater speed and 60 per cent more power. The Ruckstell axle with which these trucks are equipped is planetary in principle and operation, conforming to the planetary principle of the Ford truck. The various speed changes are controlled by a handy shift lever installed in front convenient to the driver's right hand. When the lever is forward, the Ford speeds are used, and when it is pulled back, the various speeds of the Ruckstell axle give greater variation and increased power.

On the Ross Construction Company job, from the very start the efficiency of the new equipment became apparent. There was no lost motion and the trucks worked in harmony with the mixer, so that there were no delays at either end. Loads of 4,000 pounds and even 5,000 pounds were hauled over unimproved sections and over the complete highway. Heavy trucks stalled in road conditions where the lighter trucks went through without any delay. Before the job was finished, another fleet of 9 Ford trucks was added, making a total of 21 in daily operation. These additional trucks were also equipped with Ruckstell two-speed axles. In commenting on the work of this equipment Mr. Ross said: "We proved to our satisfaction that Ford trucks, Ruckstell-equipped, can handle our work with greater flexibility, greater speed, and greater economy. We finished the job ahead of time, and everybody interested was quite complimentary on the manner in which the contract was handled all the way through."

The Road Show at the Coliseum and the American Road Builders' Association Convention at the Congress Hotel, Chicago, are the biggest events on the Contractors' Program. Don't miss them.

The Effect of Haul on the Cost of Earthwork

A Study by the Bureau of Public Roads of This Element of the Cost of Excavation

By J. L. Harrison

Highway Engineer, U. S. Bureau of Public Roads

THE most reliable statistics available indicate that the annual expenditure for highway construction is now approximately $600,000,000. Of this amount, from $150,000,000 to $200,000,000 is expended on Federal-aid roads, concerning which accurate and complete data may be had. An analysis of these data discloses the fact that approximately 25 per cent of this money is spent for grading. There is no definite information as to the proportionate cost of this element on other roads, but it is probably as great as on the Federal-aid roads. If this assumption is accepted, the general magnitude of the field on which this study bears—that is, the magnitude of its direct financial aspects—may be properly presented by the general statement that from $100,000,000 to $150,000,000 is being expended annually in the movement of subgrade materials as an incident to highway construction. Any information which will improve efficiency in this field has, therefore, unusual possibilities of producing tangible savings of importance, an item which should receive careful consideration prior to beginning any investigational work.

The Federal-aid road data indicate that the unit prices at which contractors accept excavation vary between rather wide limits. Omitting from the present discussion those states in which the problem is complicated by special considerations, such as removing old pavements, extra long free haul, unusually rocky land, etc., there still remain important differences in the average unit prices bid on excavation, as the following table shows:

AVERAGE UNIT BID PRICES FOR EXCAVATION IN MISSISSIPPI VALLEY STATES, 1923

State	Quantity Under Contract	Average Cost of Excavation Per Cubic Yard	Per Cent of Lowest State Average Cost	Average Hourly Cost of Team with Driver	Free Haul Limit
	Cubic Yards	*Cents*	*Per Cent*	*Cents*	*Feet*
A	555,589	59	295	75	1,000
B	878,516	56	280	69	None
C	1,253,813	38	190	65	700
D	241,604	32	160	53	500
E	2,408,704	32	160	62	1,000
F	3,196,918	31	155	70	500
G	1,849,790	30	150	51	1,000
H	2,939,685	29	145	69	500
I	3,922,329	29	145	65	500
J	1,019,805	26	130	59	500
K	3,435,439	23	115	58	400
L	4,467,174	20	100	57	200

It has been common practice to assume that such differences in cost of excavation as are revealed by this table are due in a large measure to variations in the cost of labor and teams. These are, of course, important factors in the cost at which grading work can be accomplished, but it may be reasonably assumed that if these were the only important factors, grading prices would vary in substantial harmony with them. Figure 1 shows the variations in bid prices as given in the fourth column of the table and also the variations in average hourly cost of a team with driver as given

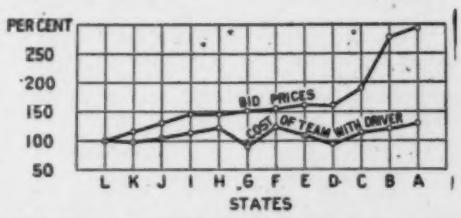


FIGURE 1. VARIATIONS IN BID PRICES FOR EARTH WORK IN TWELVE MISSISSIPPI VALLEY STATES, COMPARED WITH COST OF TEAM WITH DRIVER

in the same table. This graph plainly indicates that other factors than the cost of teams and drivers are paramount in determining variations in unit bid prices.

Among other factors the equipment used and the soil conditions encountered suggest themselves as possibly having enough influence on cost to offer an explanation of the differences not accounted for by variations in the cost of team time. As bearing on the problem in hand, these can, however, be set aside, as the states shown in the table above have been selected from the Mississippi Valley, where fresnoes, wheel-scrapers, and elevator graders are the common earth-moving equipment, and where soil conditions, while by no means uniform, are, on the whole, favorable to their use.

In this study it has not been considered necessary to differentiate sharply between the several kinds of material, such as sand, loam, and clay, as they usually occur in the Mississippi Valley, and are generally classed as common excavation. It is true that in a given time and for a given distance a normal fresno or wheeler outfit would probably move a somewhat greater quantity of one material than of another, but these differences do not appear to be sufficient to have any controlling effect on the questions here involved. Nor should the location of the material—that is, whether it is in one state or another—have any bearing on the quantity which can be moved a given distance in a given time by such an outfit. Neither small variations in the character of the material, nor its location with reference to state lines, should, therefore, enter as important factors in establishing average bid prices, especially when the quantities considered are large and contain all these materials, as they do when they result from averaging a considerable number of jobs in each state.

The depreciation, wear and tear, and breakage of equipment are large elements in the cost of moving earth. So also are loss and depreciation of stock. They are of small importance here, because there is no reason for supposing that mules or equipment depreciate faster in Dakota than in Texas, and even if it could be shown that

some difference in rate of depreciation does exist, it is not at all likely that this difference would be great enough to have any large influence on bid prices.

Length of Haul a Controlling Factor in the Cost of Earthwork

Besides these factors, there is in all excavation work the factor of length of haul. This study has brought out clearly the strong influence of length of haul on the cost of excavation. Other factors, such as the character of the soil, grades, and prevailing weather conditions, over which the designer of the road has practically no control, may operate to increase or decrease the cost of the earthwork; but the length of haul appears in general to have a more marked influence than any of these and it is an element which can be definitely controlled in advance by the designing engineer. That an increase in the length of haul which doubles the time required per trip in moving earth from the excavation to the fill will double the cost of moving it, may be accepted as a foregone conclusion.

While the study confirms the accepted practice in regard to the kind of equipment best adapted to hauls of various lengths, it appears to be well established that adaptation of equipment will not enable designing engineers or contractors to disregard distance as a primary consideration in the cost of moving subgrade materials. By showing that positive and material savings can be effected by reducing the average haul, it indicates that engineers may reconsider with profit certain of the practices which are accepted as fundamental in grade location, especially the practice of balancing cuts and fills by long end or longitudinal hauls. Consideration must, of course, be given to the use of excavation in embankments where the cost of overhaul is less than the cost of wasting plus the cost of borrow.

Team Time as a Basis for Studying Costs

Whenever an effort is made to determine the money cost of moving a yard of earth, an astonishing number of variables appear. In the first place, the amount of earth that can be moved in any given time varies with the distance it is moved The amount which can be moved per unit of time also vares somewhat with such conditions as grade, weather, temperature, etc., but whatever affects the output per unit of time affects the unit cost.

Moreover, the money cost of team time varies not only from job to job but from week to week on the same job. Hay and grain, the principal items in the cost of maintaining stock, fluctuate in price over a wide range, and other elements which enter into the cost of delivering an hour of team time on any job are equally inconstant. Therefore, to approach the problem of determining why unit bid prices are higher in some states than in others by an analysis of unit costs in dollars, seemed unwise, as the number of fluctuating elements left no apparent basis for even a day-to-day comparison of results and made the possibility of any valuable comparison as between different jobs very difficult of attainment.

For these reasons, instead of using the cost in money as a basis for comparative studies, an effort was made to develop the time-distance basis. The theory that underlies this basis of comparison is that an average mule team pulling any given variety of earth-moving equipment ought to travel as fast in the Dakotas, Kansas, or Iowa as it will travel in Texas or Louisiana if working in the same sort of material. It was recognized that high temperature in the South or low temperature in the North would probably affect the rate of travel, but it was, of course, apparent that these influences could be avoided by using a little care in the selection of the season for making field studies.

In this connection it might be observed that when a time-distance basis is adopted in the study of earth-work, the problem is reduced to one of obtaining information as to how long it normally takes to move a unit of excavation a given distance, or, to reverse the statement, how many units of excavation can be moved over any distance in a unit of time. The relationship as between different jobs and between regions is then expressed in units of team time, standard equipment and a uniform hook-up being assumed. In the application of the data secured to estimating either by engineers or by contractors, the value of team time at any point can be determined readily enough by an examination of local rates of pay, feed costs, etc., having at all times in mind the fact that team time, as here used, includes the driver and all animals used in operating a unit of equipment.

The selection of this basis for comparison makes it a simple matter to study such elements as material, grade, temperature, white versus colored drivers, etc., for, given a standard hook-up and ample time, it is possible to study these or any other factors by segregating the data which diverge from the normal only as to one factor and accumulating them until significant averages can be obtained. The results which have been secured by the use of this basis for study justify the impression that it will offer a ready solution for many grading problems which have in the past seemed more or less intangible.

The Field Work

The first step in making these studies has been to examine going construction projects with a view toward selecting for extensive study those where the amount of cut is large enough to enable the engineers to obtain appropriate data and where the equipment is standard. Jobs where the work is light have so far been avoided because, under such conditions, the outfits are apt to be so spread out that the collection of data is difficult. Jobs where the equipment is not standard or which include two or more types of equipment in the same group have also been avoided, as, under such circumstances, it is difficult to determine quantities with accuracy. In short, the first work has been to get data concerning main features, leaving special conditions for later studies. When the project is determined upon, the established practice is to select and carefully cross-section a cut. When work in this cut is begun, a record is kept of the number of hours that are required in moving the material and the distance it is moved, together with other pertinent data. As often as desired while the work is in progress, new cross-sections are taken and quantities calculated. Time studies are made daily to show the average time required to make a round trip, including loading and unloading, the average dis-

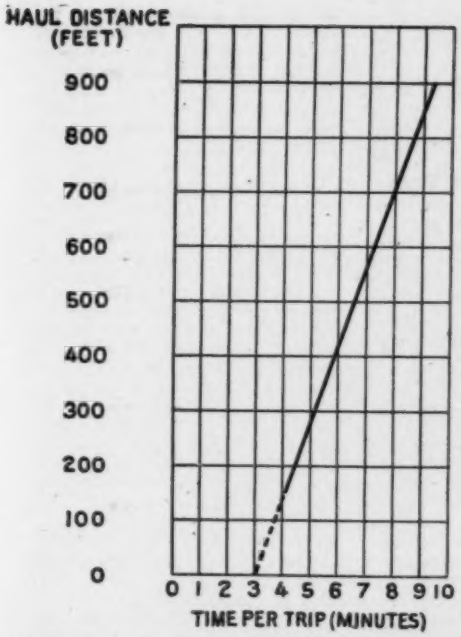


FIGURE 2. RELATION BETWEEN LENGTH OF HAUL BY NO. 2 WHEEL SCRAPER AND TIME PER TRIP

tance the earth is moved being determined with such care as is possible where a working outfit must be studied without being disturbed.

Information Developed by the Study

Figures 2 and 3 show the relation between length of haul and time required per trip by No. 2 wheel scrapers and 4-foot fresno scrapers, respectively. They represent the average relation as found in Kansas, Missouri, Oklahoma, and Texas, in which the performance is similar.

The graphs appear as straight lines, indicating, for the studies made, that the average rate at which teams travel does not change materially with the distance the load is moved. As extended, they cross the horizontal axis some distance to the right of the zero point. This distance represents the average time required for loading, unloading, and turning, together with the minor delays incident to operations of this nature. If the distance is short, material can sometimes be moved by fresno from the ditches to the embankment within the time here set down as the average for loading, unloading, and turning. As this fact has only a limited bearing on the matters discussed in the article, it is merely noted here for subsequent amplification and discussion.

Translating the general time-distance graphs into mathematical formulæ, we have, for fresnoes,

$$t = 1.2 + 0.0101\ D$$

in which,

t = time per load in minutes, and
D = distance load is moved in feet

The factor 0.0101 is governed by the rate at which teams have been found to move under average conditions. The constant 1.2 is the time consumed in loading, unloading, and turning.

For wheelers the formula similarly developed is

$$t = 3 + 0.0071D$$

Repeated measurements made in the field indicate that the average load for normally operated fresnoes ranges from slightly over ⅓-cubic yard on short hauls to slightly under ⅓-cubic yard on long hauls. The load of the ordinary wheel scraper is found in practice to vary in about the same manner with an average of 0.4 cubic yard per trip. The studies on the standard 1¼-cubic-yard wagon operated in connection with an elevator grader are not as complete as for wheelers and fresnoes, but they indicate that wagons operated with elevator graders average about 1¼ cubic yards per trip. Reducing the above formulæ to a 1-cubic-yard basis in the light of these data, we have, then, these general formulæ:

For wheel scrapers, $T = 2\frac{1}{2}\ (3 + 0.0071D)$
For fresnoes, $T = 3\ (1.2 + 0.0101D)$
in which, T = time required to handle 1 cubic yard of material

In a further analysis of the time-distance curves, it may be noted that the graphs for the fresno and wheel scraper are, in a general way, directly comparable. A fresno outfit, as operated by the usual small contractor, includes the foreman (usually the subcontractor himself), the plow team with driver and plow holder, and six to eight three-mule fresno teams with drivers. The drivers customarily load and dump as well as drive. A wheel scraper outfit of this size has a foreman (generally the subcontractor), a plow team with driver and holder, a two- to three-mule snatch

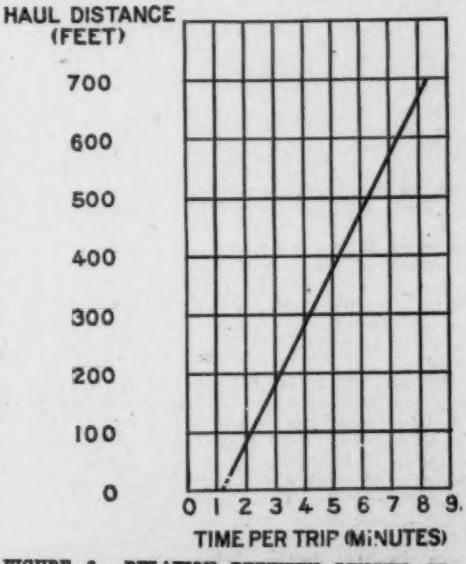


FIGURE 3. RELATION BETWEEN LENGTH OF HAUL BY 4-FOOT FRESNO SCRAPER AND TIME PER TRIP

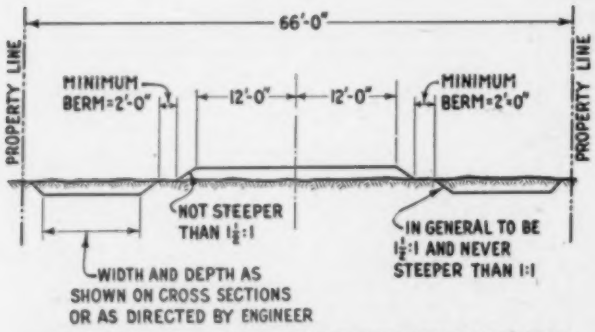


FIGURE 4.—GENERAL CROSS-SECTION USED BY STATE L

team and driver, a loader, a man on the dump and from six to ten two-mule wheelers. The items of supervision and plowing are so nearly the same, whether wheelers or fresnoes are used, that consideration of them may be omitted. As a rough generality, the commercial value of teamster's time is about the same as that of a two-mule team. The fact that a wheeler outfit uses a snatch team with driver, a loader, and a man at the dump (none of these being customarily used with a fresno outfit), which, in a general way, is equivalent to eight mules, makes up for the extra mule on the fresno. From this standpoint, the cost per unit of time of operating a fresno is so nearly the same as the cost of operating a wheel scraper, that equality may be assumed. It therefore results that the point of equal operating cost may be obtained by equating the two formulæ:

$$3\ (1.2 + 0.0101D) = 2\tfrac{1}{2}\ (3 + 0.1007 1D)$$
$$\text{or } D = 310 \text{ feet}$$

The importance of this deduction lies in the fact that it shows that wheelers cannot be successfully operated in competition with fresnoes except at hauls exceeding 300 to 350 feet, and therefore that lower bid prices cannot be secured by resorting to the use of this type of equipment. While both on the basis of mathematical development and observed field practice it appears that fresnoes should be laid aside and wheelers used at this haul distance, contractors claim that fresno hauls as long as this are hard on the stock and so must be used sparingly. The field observations confirm this claim. Moreover, from the graph for fresno work it is a simple matter to show that the teams are under full load almost twice as many minutes per hour on a 300-foot haul as they are on a 100-foot haul. It therefore appears that the statement that a 300-foot fresno haul ought not to be attempted over any extended period is sound.

The data which have been secured in regard to wagons operated in connection with elevator graders have reasonably established the fact that wagons move at about the same speed as wheel scrapers. From the limited number of studies on this type of equipment it has not yet been possible, however, to derive a mathematical statement which can be equated with the formula given for the fresno and the wheeler in order thereby to develop the haul distance below which this style should be laid aside. However, enough data have been collected to warrant the statement that while an elevator grader outfit of the usual pattern handles the longer hauls as cheaply as the wheel scraper, it has not been possible to show that it is effective in so reducing costs that it is comparable with the fresno on hauls much, if any, below 300 feet.

Results of the Study

The net result of these studies, so far as they bear on the specific problem under discussion, has been, then, to show that there appears to be no means of handling earth which eliminates the factor of distance moved as a dominant element in cost. At certain hauls a wheeler will move earth cheaper than a fresno and for the longer hauls—over 300 feet—it appears probable that the elevator grader moves earth somewhat more cheaply than either of the other forms of equipment. But no form of equipment has been found in common use which enables contractors to disregard distance as a primary consideration in the cost of moving subgrade materials. The time-distance graphs make this fact very clear. In terms of fresno operation, where the movement can be kept within 75 feet, the time required may be kept within two minutes per load, while, if the movement be 300 feet, it will require slightly over four minutes. But a grading operation that takes four minutes of team time costs the contractor twice as much as an operation requiring two minutes of team time.

It is not necessary to expand this statement to great length to justify the conclusion that grading costs may be reduced by a general modification in design which will reduce the haul distance. The state designated as L in the table consistently shows unit bid prices for excavation which are relatively low. In the light of the conclusion above reached, it is interesting to observe that two elements in the L subgrade design contribute to this, viz., the cross-section and the low free-haul limit of 200 feet. This cross-section, shown in Figure 4, somewhat generalized in order to make its variable elements clear, differs from that in general use in other parts of the country, in that it permits considerable side balancing of quantities instead of depending on a balance by end or longitudinal haul. This is accomplished by widening, sometimes accompanied by deepening the ditches so that a large percentage of the material needed for fills can be secured from alongside. In coupling a practice of this sort with a low free-haul limit, engineers find it desirable to reduce cuts to a minimum. The research work done at the Iowa State College seems to have established the fact that rolling grades are of little disadvantage to the users of highways, a proper maximum being observed. It appears, then, to be a natural conclusion from the foregoing that at least on projects with average excavation quantities lower bid prices may be secured through such adjustments of design as may be necessary in order to secure short hauls.

The time-distance graphs indicate that the current practice of balancing cuts and fills by long end or longitudinal haul is expensive. Many states have so-called free-haul limits of 500 feet or more

with design practices established in accordance therewith. In those cases where the free haul is as low as 500 feet, but is calculated from center of mass to center of mass, the actual miximum haul will not infrequently run over 1,000 feet. Of course, the amount of material moved 1,000 feet is not large, but it requires almost exactly twice as long to deliver it this distance by wheeler as it does to deliver it a distance of 300 feet. At a delivery distance of 300 feet the cost of wheeler work and fresno work is practically the same. A fresno longitudinal haul of 300 feet, in turn, takes about twice the time generally required for side borrow work. The effect of design based upon long free-haul limits on bid prices when compared in this way with short-haul work, is apparent.

ACKNOWLEDGMENT.—Text and illustrations by courtesy of *Public Roads*, U. S. Bureau of Public Roads, Department of Agriculture.

SAFETY FIRST ON A DEEP EXCAVATING JOB

Steam shovels and motor trucks have greatly reduced the time and expense involved in all kinds of excavation work, but in cases like that pictured above it is also necessary to call on the old reliable donkey-engine because a grade like this is greater than any motor truck can successfully negotiate with a capacity load. In fact, as a matter of reasonable safety it is better not to send an empty motor truck down such a grade unsupported by a cable from the rear. The grade shown is 33 per cent, being 120 feet long with a 40-foot rise. It is necessary to help all the trucks up the incline with a cable from a donkey-engine. The Autocar shown on the incline is a 4-cylinder 4- to 6-ton model, owned by P. F. Kerwin, a hauling contractor of Philadelphia. The excavating is being done for the North American Insurance Company's new building in Philadelphia

News Notes

Tucker Joins Archer Iron Works

THE ARCHER IRON WORKS, Western Avenue and 34th Place, Chicago, Ill., has announced that A. L. Tucker, for many years Chicago sales manager for the Ransome Concrete Machinery Company, Dunellen, N. J., is now associated with the Archer Iron Works as exclusive sales representative. Mr. Tucker is very well known in the equipment field, as he has been engaged in this work for the last 15 years.

New Smith Distributors

THE T. L. SMITH COMPANY, Milwaukee, Wis., has announced that it has recently appointed new distributors on the Pacific Coast and in Maryland. The Pacific Hoist & Derrick Company, with offices at 818 First Avenue, South, Seattle, Wash., will represent it on the Pacific Coast, and D. C. Elphinstone Company, Inc., located at the Continental Building, Baltimore, Md., will represent it in that territory.

Contractor Devises New Stone Effect

J. W. Sadler Company, Portland, Ore., Reproduces Rough Veneered Stone Buildings in Concrete

A TIMELY application of the use of sand molds to a special problem in veneered concrete block construction recently enabled the J. W. Sadler Company, contractors and engineers, Portland, Ore., to erect at a conservative cost to the city a machinery house of concrete that duplicated almost perfectly the physical appearance of a near-by rough veneered stone building, which it was desired to imitate.

NEW INTAKE AND SCREEN HOUSE ON BULL RUN RIVER PIPE LINE, PORTLAND, ORE.
This structure was successfully made to imitate hand-chipped stone by using molds made from blocks on the original meter house

In drawing up specifications for this new building, an intake gate and screen house at the outlet of the new Bull Run River pipe line, which was being installed to increase the municipal water-supply, the City Planning Bureau decided that it should be built to have an appearance similar to a near-by meter house, in order that the architectural beauty of the location might be maintained. The meter house had been built many years earlier, when labor costs were much lower, and its veneered stone surface had been chipped out by hand. Similar construction in the new building would far exceed the amount of money appropriated for the job, so that some form of cement effect was considered the best substitute. The contractors were urged to do their best on a small margin.

L. E. Bufton, a specialist in cement block work, was engaged by the contractors to assist in the solution of the problem. Under his expert direction, the work went forward very satisfactorily. The cement blocks that were to have the desired rough veneered finish were cast on the site of the building under his personal supervision. The completed job exceeded expectations. Not only were the costs of construction considerably less than the sum that had been set aside for the purpose, but the new gate house was an almost perfect replica of the aged stone meter shelter. This remarkable simulation of natural stone was obtained by the use of sand molds in which the blocks were cast. A certain amount of free sand in the molds mixed with each block, and this gave each veneered surface a soft, grained, velvety sand finish that bore a striking resemblance to stone. Such a result would have been impossible had cast iron molds been used.

In pouring the cement blocks, a 1:2:4 mix was used. Portland cement and plaster of Paris was the compound that was used for the patterns for the molds in which the veneered blocks were cast. The original patterns were cast from selected stones in the meter house. The cost of construction was even further lowered by first building up a skeleton of the house with the cast blocks and then pouring the main cement wall against the inner surface.

OLD METER HOUSE OF VENEERED HAND-CHIPPED STONE FROM WHICH MOLDS WERE MADE

A careful check of costs by the contractors after the work had been finished revealed that the cost of the entire job was $1,800. Based on the high cost of labor at the present time, it is estimated that at least $5,000 would have been necessary to do the work by hand.

Monighan Moves General Offices

THE Monighan Machine Company has just moved its general offices and machine shop into the recently completed addition to its factory at Augusta Street and Kilpatrick Avenue, on the Belt Railway, Chicago, Ill.

Accounting for General Contractors

A Helpful Article for Contractors, from the *Journal of Accountancy*

By Austin Savage

THE accounting problems of the general contractor and their peculiar features have been discussed from time to time. In some instances the discussion has been indefinite, and the student is left in some confusion as to what is the best method of determining the state of affairs of a general contractor's business on a given date.

Many problems call for careful consideration as to what constitutes good practice. For example, the question of anticipating profits on uncompleted contracts is one that cannot be finally determined hypothetically. The practical issues will be discussed, but prudence and careful consideration of all the facts must govern the ultimate settlement in actual practice. Much has been written against anticipating profits, and some very cogent reasons have been urged in its favor.

A general contractor's business may cover a comprehensive undertaking, where the erection of large and expensive buildings is in progress, or it may apply specifically to one branch of the industry.

Consideration will be given to the books and accounts reflecting the work performed under the terms of a contract. A contractor engaged in construction work undertakes to perform certain services and to furnish materials in accordance with the terms of the specifications and quantities called for in the contract. The work may cover the erection of a building complete or, as a subcontractor, he may be responsible for any one of the following duties: preparation of a site, excavating, foundations, erection of structural steel work, masonry, cut stone, fireproofing, sheet-metal work and roofing, carpentry, painting, glazing, tiling, plumbing, heating, electrical wiring and installation of electrical plant, elevators—passenger, freight, electric or hydraulic.

The contract may call for a lump sum or it may be on a cost-plus basis. By a lump-sum contract is meant a contract whereby a contractor undertakes to perform certain work, such as the erection of a building or a specific part thereof, for a certain sum of money. If it subsequently develops that the cost thereof is more than the specified amount, the owner is not liable for the excess. From an owner's point of view it is claimed that the disadvantages of this class of contract arise by reason of the fact that a contractor, to insure his profit, will frequently take advantage of the specifications by installing materials inferior in quality or by evading the terms in other ways, such as the omission of details in construction work. Opponents of these contracts assert that the objections justify the adoption of contracts on a cost-plus basis, notwithstanding the obvious advantages of a known cost determined by the selection of one of several bids submitted by competitors. Under cost-plus contracts it is claimed that the quality and quantity of the materials demanded by the specifications will be supplied, unnecessary expenditures will be avoided, and the architect as a representative of the owner may supervise the construction, or a job superintendent may be appointed to work under the supervision of the architect.

It is not unusual to find that a guaranteed cost is stipulated. By this is meant a maximum amount which includes the construction cost and the contractor's commission; and the owner is not further liable, irrespective of the actual amount of the construction cost. Where the commission of a contractor is fixed at a certain percentage of the cost and there is a specified maximum, it would appear to be advantageous to the contractor to increase the cost of construction up to the amount stipulated as the maximum, and thus increase the amount upon which his commission will be computed. To avoid the possibility of this, and as an inducement to effect economies where possible, a clause is sometimes inserted whereby if any saving is effected by the contractor, he shall be paid a certain percentage of the difference between the completed cost and the guaranteed cost.

The actual accounting problems of the contractor arise when he has obtained a contract and commences operations. There is no difference in the problems, whether the operations are conducted on a large or a small scale. The question is one of degree.

It is assumed that the internal organization as applied to routine duties and staff organization are functioning. This discussion relates to the financial records as reflected in the books and accounts.

Where contracts are numerous, it is customary upon receipt of the working plans and specifications to give each contract a standing order number. This establishes the identity of the contract for future reference, and thereafter all records and correspondence relative to the contracts should bear the standing order number. In practice, the following books satisfactorily meet the conditions and requirements of a general contractor, where numerous contracts are concurrent:

1. *Journals*
   - Purchase journal
   - Materials journal
   - Transfer journal
   - Charges journal—current contracts
   - " " —completed contracts
2. *Wages book*
   Salaries book
3. *Cash books*
   - Cash receipts book
   - Cash payments book
   - Petty cash disbursements book
4. *Ledgers*
   - General ledger
   - Contract ledger
   - Accounts payable ledger
5. *Cost book*

Purchase Journal

This book contains a record of all credit purchases for the account of specific contracts and for the general conduct of the business of the contractor. The ruling is shown at the top of page 72.

All invoices received are entered in the journal.

Date	Name	Particulars	Invoice No.	Fo.	Amount	Contract No.	Particulars	Fo.	Cost Book Amount	Particulars	Fo.	General Led. Amount

Suitable analyses thereof are first made on the invoices or upon a voucher attached, allocating the charges to the correct accounts. There will be two dispositions of the purchase invoices:

(a) In cost book account column
(b) In general ledger column

All purchases for the account of current contracts are entered in the cost book column, and the details are posted to the debit of the respective contract accounts in the cost book. The footings of the cost book account column are posted to the debit of a cost book account in the general ledger. The items recorded in the general ledger column will relate to revenue expenditures and also to additions to plant equipment, etc. Further analytical columns can be provided if necessary.

tions in place of the purchase journal, a ruling of a voucher register is submitted. See next form.

The totals of the vouchers payable column are posted to the credit of payable control account in the general ledger, and the routine for posting the cost book and general ledger postings is followed, as previously described. Credits for materials returned can be taken up at the end of the purchase journal.

Materials Journal

The general contractor usually carries supplies, stores and equipment for the conduct of his business. The accounts recording the materials in the nature of supplies and stores should be suitably grouped and classified, and when materials are

Date	Particulars	Cont. No.	Fo.	Total	Stores	Materials	Particulars	Fo.	Sundries	Loose Plant Equipment

The expenditures will be posted to the debit of the respective accounts in the general ledger.

In some instances details will be required to show the costs of specific parts of a complete contract, such as clearing and preparing ground, excavating, foundations, etc. The additions to the headings of analytical columns in the cost book will usually meet these requirements.

The entries in the purchase journal should furnish sufficient explanation to facilitate posting to the cost book, provided care is taken in journalizing the invoices in the first instance.

Accounts to be credited: Personal accounts of the creditors will be opened in the accounts payable ledger, and postings will be made thereto from the left side of the purchase journal. The total thereof will be posted to the control account in the general ledger. Modifications of this form of journal are frequently substituted in the form of a voucher register. The economy effected lies in the time saved by dispensing with the accounts payable ledger. Since this form of journal func-

withdrawn for use on specific contracts it is necessary that the charges therefor should be recorded and debited to the respective contracts. To meet this condition, a materials journal is used, a suitable ruling of which will provide a sufficient number of columns to take care of the various classes of materials carried on hand and charged out.

The record is written up from duplicate copies of material charges to contracts issued from the stores department. The postings are made in detail to the various contracts in the cost book, care being taken to avoid the erroneous posting of debits in respect to plant and equipment into materials columns. See form below.

The entries in the analyses columns are posted in detail to the debit of the contract accounts, and the totals thereof to the debit of the cost book account in the general ledger, and to the credit of the respective stores and plant and equipment accounts in the general ledger. Credits for materials returned may be passed through the materials book by using the end pages.

Date	Voucher No.	Name	Vouchers Payable	Payment of		Cost Book				General Ledger		
				Voucher	Chk No.	Particulars	Cont. No.	Fo.	Amount	Particulars	Fo.	Amount

Transfer Journal

The following ruling of the transfer journal will cover the requirements of the accounting system:

	Cost Book	Accts. Rec.	Accts. Pay.	Genl. Led.				Genl. Led.	Accts. Pay.	Accts. Rec.	Cost Book	

The cost book column will take care of the transfers from one contract account to another.

Charges Journal—Current Contracts

Payments received by the contractor on account in respect to work performed are primarily in the nature of instalments against work partly completed and also in respect to materials delivered to the job for work in progress. They are dealt with as follows: The amount received by the contractor is usually expressed by a percentage of the value of the work performed and authorized by an architect's certificate. Cash is debited and a personal account is opened in the accounts receivable ledger and credited with the amounts received.

A method for taking up the periodical charges is to open a charges journal, which is composed of duplicate copies of bills rendered by the contractor filed in a binder, covering the particulars of the work passed for payment by the architect or bills rendered where arrangements have been made for payments on account.

The postings are passed through the following books: accounts receivable (or contract ledger, as it is sometimes called), cost book and general ledger. Personal accounts are opened in the accounts receivable ledger which are debited with the respective charges from the journal. The respective contract accounts are credited in the cost book. The totals of the journal are credited to the cost book account in the general ledger.

Charges Journal—Completed Contracts

The object of the charges journal is to record all completed contracts. Upon completion of a contract a summary statement is prepared by the contractor showing the total contract cost of the work less the payments received on account. The balance represents the amount due the contractor. It should be understood that this statement is prepared on the basis of the terms of the contract, which may be lump-sum or cost-plus. The purpose of the statement is to furnish an account for use in final settlement. The duplicates of these statements are segregated and filed separately in the completed contracts binder. The postings of the balances due on completion are made to the debit of the personal accounts in the accounts receivable ledger and to the credit of the contract accounts in the cost book. The monthly totals of the amounts are posted to the credit of the cost book account in the general ledger.

Wages Book

The wages paid by the contractor are passed through the wages book. To facilitate the posting and to avoid unnecessary analyzing, the use of subsidiary wages books is sometimes adopted and the totals are summarized in a summary wages book. Where a single wages book is kept, the details are analyzed in columns headed with the contract numbers if chargeable to contracts. Wages not so chargeable are extended to a sundries column.

Where the contracts are not numerous, an analysis of the expenditures is made in summary form. The total chargeable to each contract is posted to the debit of the respective contract in

Wages book

Week Ending — Contract Accounts — Sundries

Date Paid	Name	No.	Fo.	Amount	No. of Contract	No. of Contract	No. of Contract	No. of Contract							Amt.

Summary wages book

Week Ending

Subsidy Wages Book Ref.	Cont. No.	Particulars	Fo.	Total	Week Ending	Week Ending	Week Ending	Week Ending	Week Ending	Sundries	Fo.	Amount

EXAMPLES OF RULINGS IN WAGES BOOKS

the cost book, and the total in the summary to the cost book account in the general ledger. Where subsidiary wages books are kept, the postings to the cost book ledger may be made either from these wages books or from the summary wages book, but preference is usually given to the latter method.

Examples of rulings of wages books are shown at the bottom of page 73.

Salaries Book

Salaries paid are summarized periodically and the amounts chargeable to contracts will relate to direct supervision. The postings will be to the debit of the particular contracts in the cost book, and to the debit of the cost book account in the general ledger. Administrative salaries will be debited to salaries account in the general ledger.

Cash Receipts Book

Cash receipts will be entered in the cash receipts book and all amounts will be deposited in the bank. The following ruling will furnish all the necessary information required:

Date	Particulars		Fo.	Bank	Disct.	Accts. Rec.	Accts. Payable	General Ledger	Sundries	Fo.	Amount
	Name	Details									

The cash receipts in respect to amounts received against contracts are posted from the cash book to the credit of the respective personal accounts in the accounts receivable ledger. The monthly total thereof will be posted to the accounts receivable control account in the general ledger.

Adjustments covering refunds from sundry creditors on accounts payable will be passed through the accounts payable column, details will be posted to the accounts payable ledger, and the totals to the credit of accounts payable control account in the general ledger.

Receipts affecting accounts in the general ledger (which are not taken up in the personal ledger columns) will be extended to the general ledger column.

Cash Payments Book

All payments, with the exception of petty cash disbursements, should be made by cheque, and in accordance with the customary practice the ruling of the cash payments book will be such as to meet the requirements, of which the following is an example:

Date	Chk. No.	Vo. No.	Name	Particulars	Fo.	Bank	Disct.	Accts. Rec.	Accts. Pay.	General Ledger	Sundries	Fo.	Amt.

It should be remarked that where the use of a voucher register is adopted in preference to a purchase journal, the detail postings to the accounts payable ledger will not be necessary, but the respective items covering the disbursements will be extended into the accounts payable column and the total thereof will be posted to the debit of the accounts payable control account in the general ledger. To conform with the ruling of the cash receipts book, provision is made for the cash adjustments on accounts receivable.

Petty Cash Disbursements

The imprest fund system is the most suitable and satisfactory method of handling the cash. The amount of the fund will depend upon the conditions and size of the business.

General Ledger

The ledger will contain the usual accounts, suitably classifying in detail the assets, liabilities and expense accounts of the business.

The controlling accounts will be: bank account, petty cash account, accounts receivable, accounts payable and cost book account. The balance shown by the cost book account should agree with the net difference of the balances abstracted from the cost book.

Cost Book

The cost book should be designed to contain a complete record of all the direct costs of construction of the various contracts undertaken by the contractor and all credits and charges against them. The ruling of this book will vary somewhat in details, but the suggested form shown at the top of page 75 will convey the principal requirements desirable.

Upon closing the cost book and abstracting the balances the status of the contracts at a given date will be disclosed. Primarily they may be classified as:

(a) Completed contracts
(b) Uncompleted contracts

Arising out of an examination of the accounts of completed contracts, particularly those closed just prior to the date of drawing off the balances, it will sometimes be found that additional expenditures have to be incurred involving amounts varying in degree. This will necessitate setting up reserves to cover the estimated amount of expenditures, which will take care of the expenditures.

An examination of uncompleted contracts in determining the profits and losses may necessitate the segregation of these contracts into two classes, as follows:

Debits								Credits								
Date	Particulars	In. or Vo. No.	Fo.	Tot.	Matls.	Wages		Date	Particulars	Fo.	Credits	Bills Rend.	Tot.	Fo.	Work in Progress	Prof. or Loss

RULINGS FOR COST BOOK

(a) Contracts nearly completed, upon which an estimate may be made of the amount required to cover cost of completion
(b) Contracts extending over a long period of time, upon which it is desired to take credit for the estimated profit thereon at the time of closing the books

There are well-known fundamental objections to the anticipation of profits on uncompleted contracts. Reserves, made for the purpose of closing out contracts by debiting estimated charges thereon, may be understated by omitting charges of some specified work or where the estimate is insufficient to cover actual work subsequently to be performed. What may appear to be a most conservative estimate at the time of closing the books by the contractor may subsequently be found, upon conclusion of the work, to have been overstated; and not infrequently losses are eventually disclosed where profits were expected. Unusual conditions may arise which could not be foreseen, such as defects in construction or in the quality of the materials furnished, and the cost of correcting any one of the defects may override whatever profit was anticipated and more.

It should be borne in mind that in passing upon reserves of this description made by a contractor covering anticipated profits, his estimates are based on his experience, which is something better than a guess but something worse than actual knowledge itself. Where a contract has a long time to run, the possibility of correctly determining profits on completed work may be so problematical that, taking all known facts into consideration, it finally devolves into a guess.

Notwithstanding the danger and disadvantages of anticipating profits, the practice is nevertheless sometimes condoned, with qualifications, where, for instance, it appears there is some substantial evidence of its justification, as in the case of contracts which are on the verge of completion, and the work thereon has been approved by the architect up to this point, as evidenced by the approval certificates and the accounts in the cost book. Examination of the terms of the contract and the supporting evidence of the approved certificates of the architect should furnish confirmation of the status of such contracts as are stated to be approximately completed.

In the reserves for the estimated amounts required to complete specified contracts, the journal entries will set up the debits to the particular contracts and the corresponding credits to reserve account for cost of completing contracts. The total of the debits will be posted to the cost book account in the general ledger, and the details will be posted to the debit of the particular contract accounts in the cost book. The reserve account opened in the general ledger will be credited with the total amount thereof.

Reserves created for purposes of anticipating the estimated amounts of profits to be earned on uncompleted contracts will be passed through the transfer journal, crediting the specified contracts with the estimated amounts and debiting a reserve account for profit on uncompleted contracts. The respective contracts in the cost book will be credited with the particular amounts so reserved, and the total will be credited to the cost book account in the general ledger. The reserve account for profit on uncompleted contracts in the general ledger will take up the debit therefor.

The list of cost book balances subject to the foregoing adjustments will then reflect the status of the various contracts according to the cost book, and the balance of the profit or loss column will disclose the gross profit or loss. This amount must agree with the balance of the cost book account in the general ledger, which is the control account of the cost book balances.

It is not unusual in businesses of this description to find that the contractor has received payments on account for which no bills have been rendered. These are reflected by credit balances on the accounts receivable or contract ledger. The usual method of treating items of this description in cases of this kind is to set up a separate schedule, and for balance-sheet purposes to deduct the total from the amount of work in progress.

Loose Plant and Equipment

In some cases a contractor has to carry a valuable quantity of loose plant and equipment. This may be acquired for specific contracts on hand, or may represent part of his loose plant and equipment carried for the general conduct of his business. Where acquired for specific purposes, and where the asset will have no further value beyond its realizable scrap value on completion of the contract, the cost is chargeable to the contract, and any amount realized on sale of surplus stock remaining after completion is credited to the cost of the contract.

Where the loose plant and equipment used on contracts form part of the contractor's equipment, it is sometimes considered desirable to charge the value of the asset to the contracts. In that case, while not forming part of the cost, the entries are a memorandum record showing the disposition of the asset.

Provision will be made for depreciation, which is chargeable to the particular contracts, where these are of considerable value and occupy a long time in execution. Instances arise, however, in

which depreciation of loose plant and equipment is charged against the general revenue of the business, and not against specific contracts, the reason for this being that numerous contracts of similar nature are carried on simultaneously, and the problem is simplified if the total depreciation is dealt with in one amount and deducted from the book value of this asset, as shown in the general ledger.

In the treatment of repairs and renewals to loose plant and equipment, different methods are applied which are not always correct from an accounting aspect. If the contract is originally charged with the value of loose plant and equipment forming part of the cost of the job it is usual to debit the contract with the cost of renewals. Where the asset value is charged to the contract as a memorandum record, the cost of renewals may be found to have been incorrectly charged to repairs and renewals account, and not to the contract as above stated. This will be misleading when the loose plant and equipment are returned from the contract to the contractor's yard, as upon recording the value of the plant returned, the amount thereof will not reflect the amount originally charged, but the amount plus the value of those items taken in and charged as renewals, some of which may be additions and still have an asset value. This necessitates an additional charge, transferring the cost of these additions to loose plant and equipment account and crediting renewals account.

Where the value of loose plant and equipment account is maintained at a certain value, the usual practice is to charge off all renewals against revenue; but there is sometimes a difficulty in determining what are renewals and what are additions, unless there is a detailed inventory available, which is not always the case. If there is no means of ascertaining the nature of the expenditures, an examination of the items is desirable to determine what are renewals and what constitute additions. Disposition of them will be made accordingly.

Where the value of loose plant and equipment is considerable, an accurate record can be kept by classifying the expenditures into representative groups, on the following lines:

Transportation and Lifting Apparatus

Barrows
Blocks—chain
Blocks and falls—rope
Chains and chain slings
Cords
Crane hooks and shackles
Hand carts
Horses
Horse carts, vans and wagons
Jacks—hydraulic
Jacks—screw
Lifting-dogs
Lifting-screws
Motor trucks
Motor vans
Ropes—hemp and manilla
Ropes—wire
Steam wagons
Tongs—lifting
Tongs—timber
Trolleys—hand sack
Trolleys—flat
Weighing-machines platform

Portable Mechanical Appliances

Boring appliances
Drills—electric
Flexible shafts and tools
Pneumatic hammers
Press—arbor and straightening
Pumps

Gages and Mechanical Measuring Appliances

Bevels
Compasses
Gages—depth and height
Indicators—measuring
Plumb—bobs
Rules — standard and contraction
Squares
Straight edges
Tapes—measuring

Hand Tools

Chisels
Drill braces—breast
Drill braces—rabbet
Files and rasps
File handles
Hack-saws — frames and blades
Hammers — hand and sledge
Mallets
Oilstones
Pipe cutters
Pipe wrenches
Punches
Reamers
Spanners—adjustable
Spanners—plain
Stocks and dies
Stud extractors
Taps
Tap wrenches
Wrenches—pipe

New Diesel Driven Excavator

One-Cubic-Yard Dipper, Dragline or Clam-shell Operated on 40-foot Boom

A NEW diesel-driven machine has been added to the line of power-driven excavators made by the Harnischfeger Corporation, Milwaukee, Wis. This machine, known as Model 208, is provided with a one-cubic-yard struck measure dipper and can also be equipped with a one-cubic-yard dragline or clam-shell bucket operating on a 40-foot boom.

The diesel-operated machine is a comparatively new development in excavating machinery. It has the advantage of high thermal efficiency and will burn a cheap grade of fuel oil. The engine is of the mechanical injection type, and is of simple, rigid construction. The crank-shaft, wrist-pins, bearings, etc., are of extra heavy construction, and the speed is very low, reducing vibration to a minimum. This outfit has many features of interest to contractors engaged in grading work.

A NEW DIESEL-DRIVEN EXCAVATOR

Are You Making the Best Use of the Catalog Service?

We regularly publish in CONTRACTORS' & ENGINEERS' MONTHLY two pages of items describing new literature on contracting equipment. A careful study of these pages each month will assist you in keeping abreast of the times. See pages 83 and 84 in this issue.

Power Shovels in Underground Work

Power, Water-Supply, Railroad and Vehicular Tunnel Construction Now Making Use of Large and Small Power Shovels

THE application of labor-saving material - moving equipment in every phase of contracting work has made rapid strides in the last few years. Noteworthy in this progress is the increasing use of different types of power shovels in handling material in rock and subaqueous tunneling. Among the noteworthy tunnels completed within the last two years or still in the process of construction are the Niagara Power Tunnel, the tunnel of the Wanaque project of the North Jersey Water-Supply Commission, the Moffat Tunnel in Denver, the Shandaken Tunnel of the New York Water-Supply and the New York-New Jersey Vehicular Tunnel.

TWO THEW SHOVELS MEETING IN THE HEADING OF THE NIAGARA POWER TUNNEL

The Niagara Power Tunnel

The latest Niagara Power Tunnel, which was begun in 1921 and finished two years later, is 4,300 feet long, 32 feet in diameter (finished size), and 140 feet below the ground surface, and is bored entirely through solid rock. In the construction of this tunnel, two vertical shafts were first sunk to a depth of 140 feet, which took only three months. During this time five Thew steam shovels were prepared for the clean-up work in the tunnel. The standard cabs as well as the steam boilers were removed and small sloping shelter cabs were built as a protection against the possible falling of rocks from the tunnel roof. Shorter booms and dipper sticks were also installed. It was proposed to operate these shovels by air from the same line that would operate the rock drills. This line carried 90 pounds pressure, and no changes were made in the standard steam engine with which these shovels were equipped.

Four shovels were lowered into the two vertical shafts, with the intention of working both ways from each shaft. Another was placed at the outlet end to work from the other direction. The first step taken by the contractors, The Read-Coddington Company of Niagara Falls, was to drive the heading the entire length. The drilling and blasting crews worked during the day, and the shovels cleaned up the material during the night. The progress in the heading averaged 9 linear feet per day, and so uniform was the progress that the variation was only a foot or two from the average on any day's work. The rock was so solid that no shoring or other supports were required. The tunnel roof was self-supporting, but as a precaution the heading was arched with steel roof supports, then planked and dry-packed with small rock behind the steel as the heading progressed. After the heading was completed, the rest of the rock was taken out in three benches, each bench progressing at the average rate of 7 linear feet per day, which was sufficient to keep in advance of the lining work. The spoil was loaded by the Thew shovels into 4-yard electrically operated cars and hauled to the vertical shafts, where it was raised to the surface by means of electric hoists of 4-yard capacity,

A THEW SHOVEL IN THE NIAGARA POWER TUNNEL CLEANING UP ONE OF THE HEADINGS

MARION SHOVEL MUCKING FULL SECTION IN LIBERTY TUNNEL CONSTRUCTION, PITTSBURGH, PA.

HOAR SHOVEL IN THE GREAT NOTCH TUNNEL WANAQUE PROJECT OF THE NORTH JERSEY DISTRICT WATER-SUPPLY COMMISSION

and loaded into Pierce-Arrow trucks equipped with 4-yard bodies. The disposal grounds were located about 3 miles from the job. Because of the expense of lowering these shovels into the tunnel and the impossibility of substituting if anything went wrong, great care was taken to see that the equipment was of the best and in first rate condition before the work started.

Other features of the construction of the Niagara Falls Power Tunnel were described in detail on pages 47-49 of the June, 1923, issue of CONTRACTORS' AND ENGINEERS' MONTHLY.

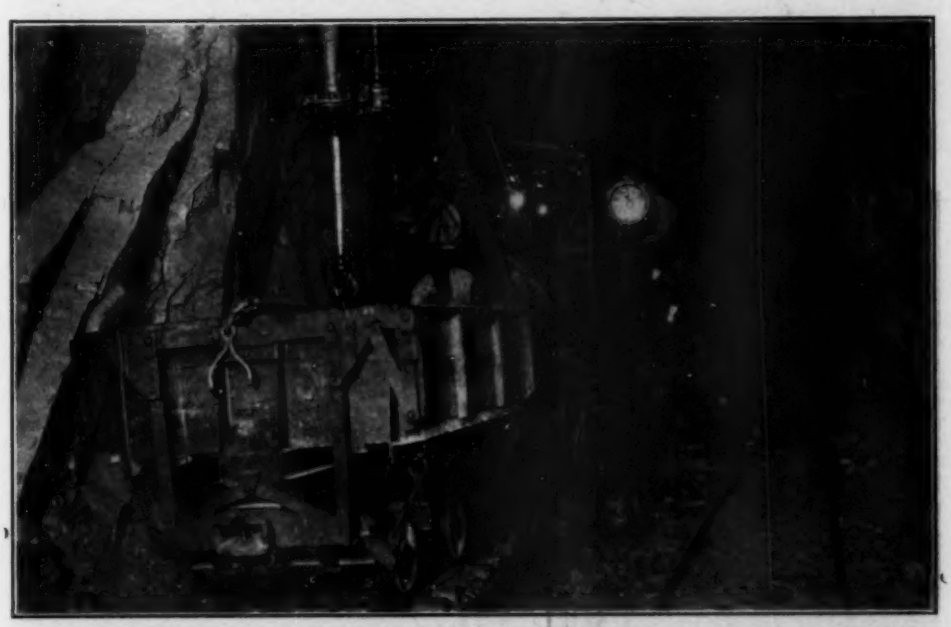
Great Notch Tunnel—Wanaque Project

In the building of the Great Notch Tunnel of the Wanaque project of the Newark water-supply, described in full in the September, 1923, issue of CONTRACTORS' & ENGINEERS' MONTHLY, the mucking was handled by a Hoar mechanical shovel. Owing to the small size of the tunnel, the contractors, Heyman & Goodman, of Jersey City, decided to blow the entire heading, which was 9 feet high and 9 feet wide, at one shot. Twenty holes were driven in the heading, using three Water Leyner drills. The holes were charged with 6 pounds of Atlas 60 per cent powder per cubic yard and fired in six successive shots. Drilling was performed in two shifts, and after firing at the end of each shift, the mucking was performed by the Hoar shovel. The tunnel work progressed at rates varying from 44 to 79 feet per week, the larger figures being the result of mechanical mucking and the use of the two-shot method.

Tunneling on the Hetch Hetchy Project

The Construction Company of North America, C. C. Tinkler, President, Mills building, San Francisco, Calif., used several types of shovels on the Hetch Hetchy work. Among them were the Myers-Whaley electrically-driven shovel, the Armstrong Shuveloder, and Hoar shovels. The Hoar shovels used were of the small size equipped with a 4.5-cubic-foot dipper and one No. 1 machine equipped with a 10-cubic-foot dipper. Favorable results were secured by the shovels as to output and costs. In operating through slate and diorite for 14 months, the small Hoar shovel moved 44,232 cubic yards in heading Nos. 7 and 8 of the Hetch Hetchy project at a cost of 10.2 cents per cubic yard for renewals and 3.8 cents for labor, making a total of 14 cents per cubic yard. On the job the rates of pay were $7 for mechanics, $5 for helpers, $5.25 for blacksmiths, and $5 for blacksmiths' helpers on a basis of an 8-hour working day.

This company also gives data on two months' operation of a Hoar shovel on the Mountain Tunnel Division of the Hetch Hetchy water-supply. The rock excavated during the operation in driving 1,616 lineal feet of tunnel from two headings, using two shovels, was a diorite and represented approximately 17,937 tons at a cost of $190.88 for repair parts, or 1.07 cents per ton, and a labor charge for repairs of $444.45, or 2.5 cents per ton. The rates of wages on this job were, mechanics $7, mechanics' helpers $5.50, blacksmiths $6.25, and blacksmiths' helpers $5, all on an 8-hour a day basis.



THE 75-H.P. OSGOOD AIR SHOVEL WITH ¾-YARD BUCKET LOADING 4-YARD KOPPEL CARS IN THE MOFFAT RAILROAD TUNNEL

The car-lifting device at the rear of the shovel saves the time usually required to switch empties

Full Section Excavation of Liberty Tunnels

Full section face work and steam shovel mucking was one of the features of the work on the Liberty Tunnels by Booth & Flinn. Each of the two tubes is 26½ feet wide and 5,715 feet long. The nature of the rock through which the tunnel was driven controlled the construction methods, both in general plan and in detail. The material, a horizontally bedded and slightly fissured shale, carried practically no water and weathered rapidly, but for months after opening was not subject to slides or falls and put little weight on the lagging. Because of these conditions, a simple arched roof timbering was used, and the excavation was made to full section right at the working face, permitting the lining to be kept close up to the heading, usually within 100 to 150 feet. The face was drilled or shot in the upper or arch heading, and a very short bench, just long enough to give room for drilling, was left. All of the face muck was taken out with Marion steam shovels. The rate of progress was 10 feet a day, or 250 to 260 feet per month.

Mucking in the Moffat Tunnel

Hitchcock & Tinkler, contractors for the Moffat Tunnel, are using Conweigh loaders for small tunnel work. There are six of these loaders in operation, three at the east portal and three at the west portal, the first machine having been installed in 1924. The machines are used in the excavation of headings 9 feet wide and 8 feet high, the headings being parallel to each other, and the alternating system of excavating is followed, that is, drilling and blasting in one heading while mucking in the other, and vice versa.

The average progress per 24-hour day is 46 feet, equivalent to 130 cubic yards actual excavation, or about 300 tons. In the mucking operation, Hitchcock & Tinkler use one operator, assisted by three or four muckers, the latter for switching in empties, trimming, cleaning up, and laying track sections at the head of the loader. The average loading time for a car of 52 cubic feet capacity is about two minutes. The average loading and switching time depends entirely upon how close the siding is kept up behind the loader.

The average cost of maintenance for seven months on these machines, including labor and material, was about 13 cents per cubic yard, with wage rates for mechanics and helpers from $5 to $10 per day. All of the repairs are made in the contractors' own shop, and, according to their statement, one of the most satisfactory features of the machine is that it consists of few parts, thus lessening maintenance and storage of spare parts.

MARION ELECTRIC SHOVEL WORKING ON ROUTE 52, SECTION 3, OF THE FLUSHING EXTENSION OF THE CORONA SUBWAY, FLUSHING, L. I.

This shovel, owned by the Oakdale Construction Company, is used in heavy tunneling in making the cut, which is 70 feet wide. Because of the heavy timbering, the shovel has to operate in exceptionally close quarters

The Holland Tunnel

Booth & Flinn, Ltd., contractors for the subaqueous work on the Holland Tunnel for vehicular traffic between New York City and Jersey City, N. J., for some time used a Myers-Whaley excavator in handling the muck. The muck was permitted to flow into the tunnel when the immense 29-foot, 6-inch diameter shield was forced forward by the thirty 10-inch hydraulic rams, each of which exerts a pressure of 200 tons at a working pressure of 5,000 pounds per square inch. This muck, particularly well illustrated on page 65 of the April, 1924, issue of CONTRACTORS' & ENGINEERS' MONTHLY, varied greatly in consistency, so that in spite of its efficiency the excavator was not continued very long on this work. Furthermore, as the tunnel progressed into deeper water it was necessary to keep a large portion of the muck in the bottom of the tunnel as ballast, so that the entire tube would not rise.

A CONWEIGH LOADER AT WORK IN THE MOFFAT TUNNEL

To facilitate working in the lower part of the shield, the muck was permitted to flow in at the top over a platform during the latter part of the work, then sliding down to the bottom of the tunnel over a wooden apron. It was then loaded by hand into industrial railway cars.

Breach of Contract to Furnish Materials

ACCORDING to a decision of the Georgia Court of Appeals (Ladd Lime & Stone Co. v. MacDougald Construction Company, 124 Southeastern Reporter, 551), where a seller of materials, such as crushed stone, knows that the buyer is engaged in a construction project which necessitates considerable expenditures from day to day, and that the materials bought are needed in such project, and that a delay in delivery will cause loss to the buyer in idle labor and idle equipment, judgment to reimburse against such loss properly may be awarded by the court.

It was decided in the same case that one who had contracted to sell a quantity of crushed stone was not exonerated from liability for failure to perform because cars could not be obtained to ship the stone to the contract destinations, where the buyer offered to accept delivery at other points to which shipment could be made. On this last mentioned aspect, the Court applied the general rule that non-performance of a contract not excusable on the ground of impossibility of performance if the other party offers to remove the cause preventing performance according to the terms of the agreement.

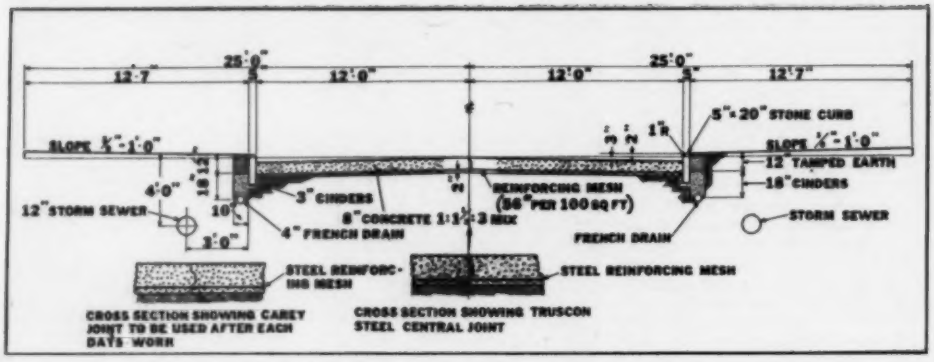
The Skyline Boulevard

Interesting Project Depicted on Front Cover

AMONG the latest additions to the California state highways is the Skyline Boulevard, a portion of the construction of which is illustrated on the front cover of this issue of CONTRACTORS' AND ENGINEERS' MONTHLY through the courtesy of the Northwest Engineering Company, Chicago, Ill. This boulevard runs from San Francisco to Santa Cruz. Only the first two sections have been completed, beginning at Sloat Boulevard, San Francisco, and running 26 miles out of the city. This was opened for traffic in October, 1923.

J. P. Holland began the work on the third section on March 27, 1924. This section is 6½ miles long and consists of 180,000 cubic yards. The grading has been completed and the surfacing with gravel is just being finished. Owing to the efficiency of the contractor's organization, his work was extended to cover the fourth section of 7 miles consisting of 400,000 cubic yards. Work has already been started on this section of the job, and two gasoline shovels and three steam shovels are being used. At present only the excavating necessary to haul is being done. When the rainy season sets in, the steam machines will be shut down and only gas machines left in service, for it is much easier to get gas to the gasoline engines than to get fuel, oil and water to those powered with steam.

Because of the beauty of the scenery along the drive, and the general interest of the public, the work has attracted a great deal of attention, and it is said that there is hardly a contractor within a hundred-mile radius of the work or a highway engineer or official who has not visited the job at one time or another.



CROSS-SECTION OF MONOLITHIC CONCRETE PAVEMENT WITH STONE CURB

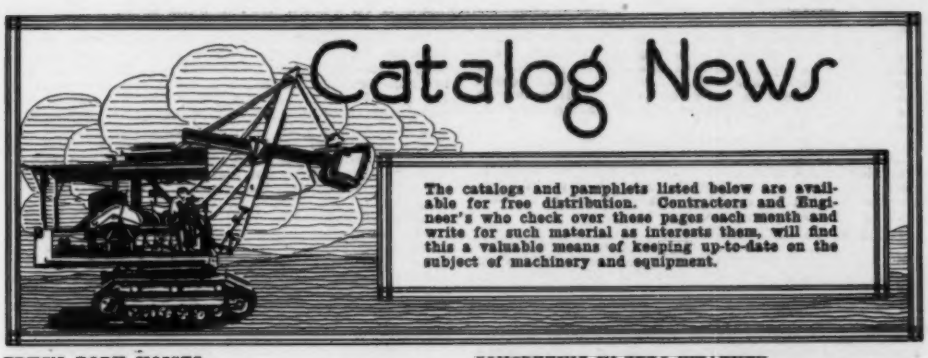
Mechanical Tamper Used on City Concrete Streets

Machine Runs on Plates Set on Curbs

IN the Good Times Program of concrete street construction undertaken by Bedford, Ohio, near Cleveland, the concrete is spread and tamped mechanically. A cross-section of the pavement is shown above. On some of the construction the concrete curb is placed instead of the stone curb, but in any event the finishing machine for spreading and tamping must travel on the curb instead of the steel side forms used for rails on ordinary highway construction. Steel plates bent to an angle shape are laid along the top of the curb to protect it. Four such plates, each about 10 feet long, were used on each side of the pavement. These are taken up and relaid as the machine advances.

The strike-off and tamper of the finishing machine were fitted with extensions so that they would operate at the required distance below the tops of the curb. It was not possible to use the regular finishing belt of the machine, because the curbs did not allow clearance for it. The final floating of the surface was done with a wood float extending the full width of the pavement and provided with plow handles on each end. After this Lakewood mechanical finisher, made by the Lakewood Engineering Company, Cleveland, Ohio, had spread and tamped the slabs, one or two trips over with the wood float completed the job. The result is a slab of greater density because of the tamping it receives, which drives out air and water voids, with a smoother riding surface than can usually be obtained by hand methods. B. T. Wright, Village Engineer, is in charge of the work.

LAKEWOOD FINISHING MACHINE RUNNING ON BENT PLATES LAID ON CURB


Catalog News
The catalogs and pamphlets listed below are available for free distribution. Contractors and Engineer's who check over these pages each month and write for such material as interests them, will find this a valuable means of keeping up-to-date on the subject of machinery and equipment.

TRUCK BODY HOISTS

Catalog No. 140, which has been issued by the Heil Co., 1243-26th Ave., Milwaukee, Wis., gives complete information regarding the simplicity of Heil hoist construction and the value of these hoists on light-duty and heavy-duty trucks.

A GASOLINE CRANE EXCAVATOR

Bulletin CE-6, issued by the Koehring Co., Milwaukee, Wis., describes the Koehring crane excavator, which is designed for gasoline power and not merely powered with a gas engine.

WHEN AND HOW TO HANDLE FACTORY MAINTENANCE

The Truscon Laboratories, Detroit, Mich., have issued a particularly interesting maintenance map which depicts a standard factory building in sections and gives complete information as to quantities and methods for properly maintaining every part of the building and machinery from the sub-basement to the top of the water-tank or power-plant stack.

THE CARE AND OPERATION OF MOTOR TRUCKS

This is the title of a pocket-size booklet which municipal engineers and other officials, as well as contractors, should secure for distribution among their chauffeurs and truck drivers, as the information given is particularly valuable and applicable to all makes of trucks. The booklet may be secured free from the General Motors Truck Co., Dept. 49, Pontiac, Mich.

DIRECT-CONNECTED CENTRIFUGAL PUMPING OUTFITS

Contractors will be interested in new direct-connected centrifugal pumping outfits which have been brought out by the Novo Engine Co., Lansing, Mich., and are described in detail in Data Sheet No. 118.

INCREASING THE POWER OF ONE-TON TRUCKS

A set of sliding gears with three speeds for cars and four speeds for trucks is available in the Hinckley transmission, which is described in detail in literature which may be secured from Hinckley Motors, Inc., Box E-839, Detroit, Mich.

QUICK-DUMP BODIES AND TRAILERS

The Easton trailer, which is used on grading and excavating jobs all over the country, and the Easton Rapidump body for Ford trucks are described in the literature of the Easton Car & Construction Co., Easton, Pa.

A ROAD BUILDERS' TRUCK

The United "Constructor," which is a truck sold exclusively to contractors through reliable distributors of contractors' equipment, is described in literature which may be secured from the United Motors Products Co., Grand Rapids, Mich.

GOVERNORS FOR FORDSONS

Bulletin G-7 issued by the Pickering Governor Co., Portland, Conn., describes the governor which saves gasoline on the Fordson tractor without impairing the power of this unit in any way.

SAND AND DREDGING PUMPS

Bulletin No. 20 issued by the Morris Machine Works, Baldwinsville, N. Y., contains 44 pages of helpful information on sand and dredging pumps and hydraulic dredge machinery of interest to contractors in these fields.

PORTABLE AND SEMI-PORTABLE GASOLINE ENGINES

In Bulletin 23-E, the Domestic Engine & Pump Co., Shippensburg, Pa., describes its complete line of 2 and 4 to 15 H. P. gasoline and gas engines with steel channel mounting, particularly adaptable for contracting work.

CONCRETING IN ZERO WEATHER

Bulletin No. 42 issued by the Aeroil Burner Co., Inc., Hudson Ave. and Main St., Union Hill, N. J., contains a great deal of helpful information on the use of Aeroil kerosene flame concrete heaters to heat materials as well as the mixer drum.

SINGLE-DRUM HOISTS AND FORDSON WINCHES

In Boss Hoist Bulletin No. 117, issued by the American Cement Machine Co., Keokuk, Ia., contractors will find a great deal of interesting data on single- and double-drum hoists and a Fordson winch which has been found a particularly helpful unit by many contractors.

KEEPING WINTER ROADS OPEN

This is the title of a new illustrated letter-size booklet, C-241, which has just been issued by the Holt Mfg. Co., Inc., Peoria, Ill. It contains valuable information as to how to break the snow blockade and maintain traffic on city streets and on main routes in all places where snow hinders traffic in the winter months.

LIGHT-WEIGHT REVERSIBLE HOIST

Ideal reversible hoists operated by the New-Way air-cooled engine, which makes a dependable, light-weight unit for general contracting service, is described in literature which may be secured from the Universal Hoist and Mfg. Co., Cedar Falls, Iowa.

LONG-LIVED HAMMER DRILLS

Wood hammer drills, which have positive rotation and long life as well as minimum up-keep cost, are described in the literature of the Wood Drill Works, 30-36 Dale Ave., Paterson, N. J.

LEATHER-BOUND BOOKS ON ROAD CONSTRUCTION AND MAINTENANCE

The Dow Chemical Co., 43 Water St., Midland, Mich., has published two leather-bound books, "How to Maintain Roads" and "How to Cure Concrete," which are prepared in an instructive and helpful manner and which may be secured by contractors, road engineers and municipal officials free on request.

24-HOUR USABLE CONCRETE

The Atlas Lumnite Cement Co., 25 Broadway, New York City, has issued a booklet, "24-Hour Concrete," that describes the uses of Lumnite cement, which gains the full strength of 28-day concrete in 24 hours. This makes possible a great many repairs and jobs that heretofore have been impossible through the use of portland cement.

9-15-TON GASOLINE LOCOMOTIVES

Publication No. 135, issued by the Milwaukee Locomotive Mfg. Co., Milwaukee, Wis., gives complete specifications and all details regarding the field, usefulness and parts of Milwaukee gasoline locomotives of 9-, 10- and 15-ton weights.

TRUCKS DESIGNED BY ROAD BUILDERS

The Hug Truck Co., Highland, Ill., will be pleased to send its latest literature describing the Hug truck which was designed by a road-builder especially for this type of work.

HAND AND POWER PUMPS

The fifth edition of the General Catalog of the Rumsey Pump Co., Ltd., Seneca Falls, N. Y., describes the complete line of Rumsey hand and power pumps, including cistern and pitcher pumps, hand and windmill well pumps, deep-well working heads, house force pumps, contractors' pumps, small power and double-acting power pumps, horizontal jack pumps, hydraulic rams, centrifugal power pumps, hand and power rotary pumps, triplex power pumps, etc.

A QUICK-ACTING DUMP BODY

A Stewart quick-acting self-dumper steel body which saves time, labor and money when installed on Ford trucks, is described in the literature of the Stewart Iron Works Co., Inc., Cincinnati, Ohio.

BETTER ASPHALT STREET REPAIRS

The new improved model of the Equitable surface heater which is operated with a gasoline engine, thus simplifying its operation and making it possible to resurface without flame from 1,500 to 2,000 square yards of pavement in an 8-hour day, is described in the literature of the Equitable Asphalt Maintenance Co., Kansas City, Mo.

INVESTIGATE TRACTOR HAULING

It will pay any contractor to investigate the possible reduction of his haulage costs by crawler type tractors. Best "Sixties" and "Thirties" for this type of work are described in the complete catalog of the C. L. Best Tractor Co., San Leandro, Cal.

LOWER EXCAVATING COSTS

The Model 16-B Bay City one-man excavator for small jobs can be equipped with a skimmer or trench scoop or shovel as well as clam-shell and crane attachments. This versatile machine is described in the literature of the Bay City Dredge Works, Bay City, Mich.

GASOLINE LOCOMOTIVES MAKE RECORDS

Bulletin HC-251 issued by the Yate-Root-Heath Co., Plymouth Locomotive Works, Plymouth, Ohio, gives a lot of information regarding Plymouth gasoline locomotives, which this last year have helped hang up two world's records in concrete paving in Illinois.

FORMGRADERS FOR CONCRETE ROAD WORK

Formgraders on concrete road jobs make it possible to set the road forms on solid ground, save labor, increase capacity, and are particularly advantageous where the thickened-edge cross-section road is to be laid. Full particulars regarding this machine may be secured from Edward G. Carr, 224 West Huron St., Chicago, Ill.

TRANSITS AND LEVELS

Folder T-3 which has just been issued by the Warren-Knight Co., 136 N. 12th St., Philadelphia, Pa., describes the Delaware River Model Sterling transit and the engineers' wye level which have proved so popular with contractors and engineers.

HIGH-SPEED, LOW-COST CONCRETE PRODUCTION

There are already 25,000 Jaeger concrete mixers, ranging from 3 to 14 cubic feet of mixed concrete per batch, in use by contractors and cities. The illustrated catalog of the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio, describes these mixers in detail.

1000 YARDS OF DIRT A DAY

A train of 5 Baker-Maney scrapers averages 1,000 yards of dirt on moderate hauls per day. This means a saving for the contractor who is engaged on grading jobs. Complete information regarding this new Model "D" scraper may be secured from the Baker Mfg. Co., 585 Stanford Ave., Springfield, Ill.

AN ECONOMICAL TILTING MIXER

The Kwik-Mix mixer, which is made in sizes of from 2 to 5 cubic feet of mixed concrete per batch, and which has an extra-large drum, low charging height, is quick mixing and has single-lever control, is described in the literature of the Kwik-Mix Concrete Mixer Co., Port Washington, Wis.

A CONCRETE SURFACING MACHINE

The Berg concrete cutting tool, which absolutely removes all projections caused by slight leakage at forms and leaves a slightly roughened surface that offers minute keys to bind permanently any float or rubbed finish to the old concrete, is described in literature which may be secured from Dept. CEM, Concrete Surfacing Mchy. Co., 2669 Spring Grove Ave., Cincinnati, Ohio.

A TRUCK-MOUNTED MIXER

The Speedmobile, made up of the well-known Archer concrete mixer mounted on a Ford unit, providing a machine which can move speedily from one point to another and produce well-mixed concrete quickly, is described in the catalog of the Archer Iron Works, Western Ave. and 34th Place, Chicago, Ill.

BETTER SURFACES ON CONCRETE JOBS

A better surface on concrete roads, sidewalks or floors can be secured with Abrams long-handled finishing tools, which are operated by a man standing on his feet instead of crouching in the unnatural position necessarily used with short-handled tools. These tools, as well as a copy of the contractor's magazine "The Finishing Touch," will be sent free to any one interested, by the Abrams Cement Tool Co., 3818 Grand River Ave., Detroit, Mich.

A DEPENDABLE POWER UNIT

Contractors wishing a dependable power unit for their machinery should be sure to investigate the Climax engine, which is used by many manufacturers of contractors' equipment as the standard power unit. This engine is described in literature which may be secured from the Climax Engineering Co., 1 West 18th Ave., Clinton, Iowa.

IMPROVEMENTS IN TRACTOR MODEL

The improvements shown in the 1925 Model of the Shawnee tractor, which include heavier steering gear, larger steering rod, a reinforced steering yoke, heavier ball-bearings and other features are announced in the new literature of the Shaw-Enochs Tractor Co., 2446 University Ave., S. E., Minneapolis, Minn.

A ROAD FORM FOR MECHANICAL FINISHING

The Carr steel road form, made with a round top which is self-cleaning, and with a wedge-lock, and in 12-foot sections with flat stakes, is described in Bulletin 45-M, which may be secured from the Lakewood Engineering Co., Cleveland, Ohio.

A ONE-MAN CRANE

The Bear Cat crane equipped with a 40-horsepower gasoline motor, making a one-man operated machine which can be run as a skimmer, clam-shell, ditcher, back-filler, shovel or dragline, and with full traction tread, is described in the latest catalog of the Byers Machine Co., 480 Sycamore St., Ravenna, Ohio.

CONCRETE MACHINERY

Crescent concrete machinery, for making sewer pipe, brick or tiles, as well as tilter and continuous mixers are described in various bulletins and catalogs which may be secured free from Raber & Lang Mfg. Co., 831 Mill St., Kendallville, Ind.

TRACTOR SNOW-PLOW

The new Champion V-Type snow-plow for attaching to heavy crawler tread tractors has several features which make it particularly useful where heavy snows are encountered. This plow is described in Bulletin KDV which may be secured from the Good Roads Machinery Co., Inc., Kennett Square, Pa.

NEW PORTABLE GRAVEL PLANT

The new Russell portable gravel plant screens, crushes and loads in one operation, and the feed-back principle to the crusher makes all material uniform, as no oversize can pass the screen. This outfit and the complete Russell line of road machines, elevating graders, maintenance patrol machines, scarifiers, road-drags, wheel scrapers, draglines, etc., are described in the 72-page Russell catalog which may be secured free from the Russell Grader Mfg. Co., Minneapolis, Minn.

A PRACTICAL PORTABLE PUMP

A practical pumping outfit for construction and road work, public roads departments and emergency service, which is attached to the front of any automotive equipment, is described in illustrated Bulletin No. 56 issued by the American Steam Pump Co., Battle Creek, Mich.

A 4-CYLINDER MOTOR ROAD ROLLER

The Huber 4-cylinder motor road roller, which combines a modern internal combustion engine with modern power and transmission and is easy to start and keep going, is described in literature which may be secured from the Huber Mfg. Co., 106 Center St., Marion, Ohio.

AN ASPHALT PATCH PLANT

Contractors interested in an asphalt plant which has many features making it particularly useful in patch work, or for small jobs, may secure a description and specifications from the East Iron and Machine Co., Lima, Ohio.

A MOBILE TRENCH DIGGER

A booklet, "Modern Ditch Digging," has been published by the Barber-Greene Co., 485 W. Park Ave., Aurora, Ill., which tells graphically how Barber-Greene trench diggers, because of their special construction, can handle trench digging at lower cost and with greater facility than larger units.

HOISTING BLOCKS

Star brand hoisting blocks made for every condition of service and guaranteed in their reliability, are described in the literature of the Boston and Lockport Block Co., East Boston, Mass.

AN AUTOMATIC DUMP BODY

The Superior automatic dump body, which is dumped when loaded by simply pulling a lever and is locked in dumping position until released by the driver, is of 1½ yards capacity built for Ford, Indiana, International, Graham and Service trucks, and is described in literature which may be secured from the Superior Boiler Works, Marion, Ind.

DRILLING TEST HOLES

Standard diamond core drills for testing underlying strata in foundations and dam work give positive results. Complete information will be found in Booklet No. 6, which may be secured from the Standard Diamond Drill Co., First National Bank Bldg., Chicago, Ill.

Making the Subgrade Conform to Specifications

New Machine Cuts Subgrade in Accordance with Illinois or Other Specifications for Thickened-Edge Pavement

A NEW machine adapted to cutting the subgrade at the edge of the pavement to conform with the new thickened-edge cross-section has been brought out by Edward G. Carr, 224 West Huron Street, Chicago, Ill., under the name "Formgrader." This machine is equipped with a Ford automobile engine for power, and will cut a form trench up to one foot in depth and one foot wide, as well as the slope on the inside. It will cut this trench one foot wide and six inches deep, together with the slope on the inside, and remove the dirt in one trip.

A rotary cutter shown in the illustration is driven immediately in front of the big rear wheel, the depth being controlled by a hand wheel and a gage running against the chalk line with hair-spring pressure. This gage is actuated by a pendulum, so that any tilting of the machine will not cause any variation in the grade cut below the line. The machine has working speeds of from 7 to 15 feet a minute, and a traveling speed of 3 miles an hour. Not only will this machine cut hard ground to the right height for supporting the forms, but it is also a means for rolling down soft ground where the forms are to be set. The machine illustrated is being used on the Duncan Construction Company job at Champaign, Ill., State Aid Route 17, Section 34-15 D. Philo Road, where a 9-foot pavement is being laid at the rate of 1,000 to 1,400 feet a day. The contractor states that the "Formgrader" has done away with his entire crew digging the form trench, and that it is also cutting out the shoulder next to the form, materially aiding his form grading.

VIEWS OF THE MACHINE WHICH CUTS SUBGRADE FOR THICKENED-EDGE PAVEMENT

Fighting High Costs with Machinery

CONTRACTORS' equipment has played a stellar role in our economic development. The influence of the telephone, the telegraph, the automobile, and the industrial utilization of the startling discoveries of science in numerous fields are matters of common knowledge, but how many, even among those in the construction industry, have ever given thought to the obvious fact that without the development of labor-saving contractors' equipment our civilization could not have progressed so far or so effectively? The splendid highway systems of to-day could not have been realized, thousands of buildings in which industry is housed would have remained unbuilt, architecture would have suffered because of high cost of construction and the people of America would be leading relatively narrow and restricted lives.

Lacking adequate road-building equipment, an extensive road mileage would be only a dream, barred from attainment by excessive costs. Lacking the contractors' machinery and equipment available to-day, the cost of many of the buildings which now house our industries would have been prohibitive. Our fathers depended upon hand labor to perform the multifarious tasks of construction. Notwithstanding the fact that most of the materials then available were exceedingly low-priced and manual labor was cheap, construction was straitened and building programs were limited because of the cost of slow and laborious hand processes.

The concrete mixer, the elevating grader, the tractor, the portable conveyor, the tower hoist, the ditcher, all of these and a score of other machines that might be named as readily, have all played their part in industrial and community development. They have been of inestimable value in combating rising construction costs.

With growing dependence upon machinery for the performance of construction tasks, it has become increasingly essential that up-to-date contractors provide themselves with equipment which will enable them to carry out with efficiency and speed, and at minimum cost, the construction tasks they undertake.

The inventive genius of engineers, and of men with wide practical experience in construction, is being constantly invoked in the development of new machines, and in improvements in machines of proven staunchness and serviceableness. The public has greatly benefited from the keen competition between the manufacturers of these machines in the search for the improvements in design and mechanical construction which are constantly being made.

The contractor who is to attain the fullest degree of success in his chosen field must of necessity keep himself informed of the developments in equipment, for such developments have a vital bearing upon his individual problems and profits.

—*Pacific Builder and Engineer.*

Motor Dump-Truck Equipment

Hand Hoist and Double-Acting Tail-Gate Add Materially to Usefulness of Trucks

A CAREFULLY built hand hoist for a motor truck dump body has been developed by the Rock Manufacturing Company, Waterloo, N. Y. This hoist is light in weight and takes up very little space between the cab and the body. The mast automatically follows the movement of the body as it swings upward and backward, this being accomplished entirely by the arrangement of the cable with no guide or springs required. The drum gear is cast in one piece with the drum to avoid any possibility of accident from the loosening of these parts. The pinion is made in one piece with its shaft, which makes it possible to use a very small pinion and thereby obtain a large gear reduction in a small space and with little weight.

Both the hoist and the body hinge can be applied to truck frames from 30 to 39 inches wide without change, and no holes are required to be drilled in the truck frame for mounting the hoist. The dumping angle attained is from 35 to 45 degrees, depending upon the length of the body. The hoist is guaranteed for bodies up to 3½ tons capacity.

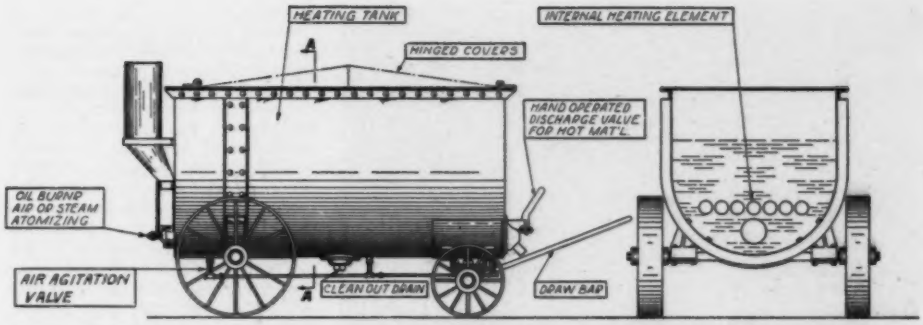
DOUBLE-END TAIL-GATE INSTALLED ON WOODEN TRUCK BODY

The body-lifting arms are bolted directly to the front two bolsters and impose no load on the front end of the body when the load is lifted. The arms do not interfere with the brake rods, or cross-members, because no part of the hoist extends below the truck frame between the side rails. A ratchet is provided to hold the load in any position, and a brake enables the body to be lowered quickly and with little effort. The weight of the hoist is about 215 pounds, and of the body hinge 45 pounds.

Double-Acting Tail-Gate

A complete set of irons for equipping a plain body with a double-acting tail-gate has also been developed by this company. The irons are easily applied and require, in addition to the irons supplied, only the usual wooden tail-gate and common bolts.

The plate, which forms part of the construction, bolts to the inside of the body. If there is a strap bolt on the inside of the body at the end, the rivets or bolts that fasten it to the body should be removed. Then the side of the body can, quite often, be sprung out enough to allow the plate to be inserted. If this cannot be done, the bolt can be removed and the hole plugged and a new hole bored a little farther from the side. The plate can then be clamped in place and the holes marked. It can then be taken out and drilled to suit the strap bolts. If the body in which the irons are to be used is more than 4 feet, 11 inches inside width, a special long top and bottom rod is required.



SIDE ELEVATION AND CROSS-SECTION OF MERRILL TAR AND ASPHALT MELTING KETTLES

A New Well-designed Heating Kettle and a Patching Unit

Arrangement of Heating Unit Prevents Burning Out of Bottom and Overheating of Material

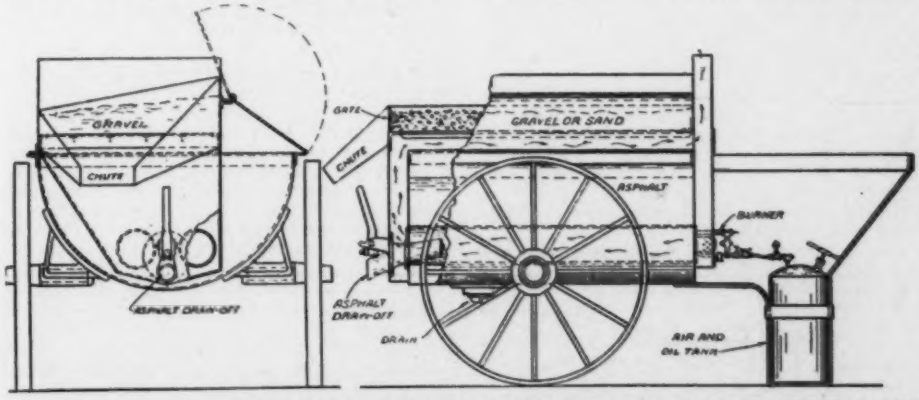
THE Merrill heating kettle, which has recently been placed on the market by Chase & Lyman, Inc., 12 Pearl Street, Boston, Mass., has many features which makes it a particularly desirable piece of equipment for the asphalt paving contractor.

The heating unit is an oil-burner which projects a flame into a large pipe located a few inches above the bottom of the sheet-steel tank. At the other end of the pipe is a header from which seven smaller tubes return to the flue. Thus heat is applied to the asphalt or tar in such a way that the burning out of the bottom is prevented. The draw-off valve is located immediately in front of the header and therefore is at the hottest part of the tank and cannot plug up.

An air-agitating system consisting of three valves located along the bottom of the tank materially speeds up the mixing of the material, making it possible with a tank capacity of 500 gallons to heat 2,110 gallons a day, the first of which can be drawn off within 30 minutes after the readily controlled oil burner is started.

It is next to impossible to burn out the bottom of this heating kettle, because the heat is not applied from a fire beneath the kettle, but through pipes inside of the kettle. Any small amount of sediment which gets into the kettle through careless handling of the asphalt or tar by the contractor's employees is readily kept in motion by the air-agitating valves. The average cost of operating the kettle is simply the cost of from two to three gallons of fuel oil per hour, which is small as compared with the cost of wood or coal, which must be stacked, stored and hauled to the heater.

Overheating of the material is prevented by partially shutting off the oil burner as soon as the material has reached the desired temperature. The non-clogging discharge valve, which is specially designed to prevent stoppage and freezing, insures a steady flow of the material. This discharge valve is hand-operated and makes it



END ELEVATION AND LONGITUDINAL SECTION OF SELF-CONTAINED PATCHER UNIT FOR ROAD MAINTENANCE WORK

MERRILL MELTING KETTLE, SHOWING OIL BURNER AND AIR-COMPRESSING UNIT

unnecessary to dip material out of the kettle.

The kettle is mounted on strong steel-rimmed wheels and, if desired, may be equipped with heavy rubber-tired wheels and springs so that it may be drawn behind a truck.

The Patcher Unit

A self-contained patcher unit for road maintenance work, built along the same general tle has also been developed by Chase & Lyman, Inc. The heating unit is similar to that described above, except that there is but one passage of the heat through the kettle. The flue at the opposite end rises to the top of the kettle and then is carried back below the pan shelf on which gravel or sand may be dried. The gases then go up the chimney, located at the same end as the burner. When the asphalt in the kettle has reached the proper temperature, the burners may be shifted so that their heat is first applied directly beneath the gravel pan. This will speed up the drying of the gravel. The return gases thus reverse their direction of travel, passing back through the heating tubes in the kettle. By the use of this kettle, which has a hand-operated draw-off valve, the simultaneous heating of the bituminous material and the gravel or sand to nearly equal temperatures is possible. The application of the heat in the manner described eliminates the burning out of the tank bottom, and it is operated at a cost of about 12 cents per hour. A number of these maintenance outfits, as well as the heating kettles, are in use by the Massachusetts State Highway Department and by asphalt contractors in many communities.

Aluminum Folding Rules

Hard, Durable, Light-Weight Rules, Particularly Good for Contractors

THE aluminum rule occupies a position between folding wood and folding steel rules, as regards both weight and durability. It is particularly popular among building contractors and in shops on any work where folding wood rules are often broken. A complete line of folding aluminum rules is now offered by the Lufkin Rule Company, Saginaw, Mich. These rules are of a special hardness which adds to their durability and enables them to hold their shape well. They are 9/16 inch wide and have 6-inch folds, and are made in 3-, 4-, 5-, and 6-foot lengths. While of a size accomodating good legible markings and figures, they are light-weight and convenient to carry. Being of aluminum with solid brass joints, they are rust-proof throughout. The spring joints are smooth-working, yet firm enough to hold the rule properly up to its work. The rule surface is in natural color with sunken black markings which show up distinctly.

One of the features optional in these rules is a

ALUMINUM RULE, SHOWING HOOK EXTENDED

folding end hook which has proved so popular on spring-joint wood rules. A small substantial brass hook is fitted to one end, so attached that it easily folds up and remains flush with the edge of the rule. The zero point falls at the inside of the hook when open, and at the extreme end of the rule, as with other rules, when the hook is closed. This feature makes it possible to take measurements out of arm's reach, and is handy in practically all work.

Slogans for Automobilists

The following are credited to a fifteen-year-old girl in Detroit:

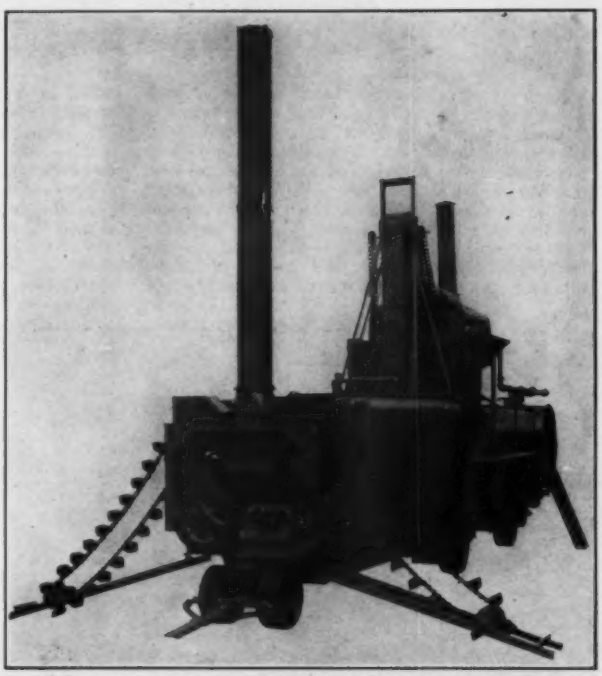
Drive right and more pedestrians will be left.
Watch your step on it.
Taking the other fellow's dust is better than "to dust returneth."
Six feet have awaited many a driver who wouldn't give an inch.
Just because you see its tracks is no sign that a train has just passed.

A Complete Two-Unit Portable Asphalt Plant

Machine of Capacity of 1,800 Yards of 2-Inch Sheet Asphalt per Day Has Many Interesting Features

THE Mosher asphalt plant, which is made by the East Iron and Machine Company, Lima, Ohio, has been on the market for some time, but recently improvements have been made in various parts of it to increase the capacity of the bin and screen, increase the horse-power of the power-plant and increase the number of elevators from two to three.

The capacity of the complete plant is 1,800 yards of 2-inch sheet asphalt or its equivalent of any other asphaltic mixture in a 10-hour day under normal conditions. Each of the two units is mounted on trucks having wheels with 12-inch facings. These units can be trailed over the road so that the plant can be set up wherever desired. There are no extra parts to haul or ship, the complete plant being contained in the two units. An ordinary plant crew can set up the plant for operation in a few hours and pack it for shipment in less time. All that is necessary is to back the two units together, make a few connections, rack up the mixer platform, and raise the stack and derricks.



THE NEW IMPROVED MOSHER PORTABLE ASPHALT PLANT

The drying drum is 3 feet 6 inches in diameter and 15 feet long and is located inside the fire-box and under the kettles. It is of extra-heavy construction, the plates being lap-jointed and securely riveted. Four heavy I-beams run through the drum from end to end, acting as spill plates, and carry up the sand and stone so that it falls through the heat as the drum revolves. The heat surrounds the drum, and passes through the combustion chamber and through the interior of the drum, so that the material gets the benefit of all the heat available. Spiral flights between the I-beams carry the material forward.

The kettles are steam melting, having a capacity of 4,500 gallons, and are constructed as one unit divided lengthwise and set over the drum saddle-wise. Heavy insulation is placed between the drum and the kettles to prevent all contact with direct fire. Each kettle is equipped with heavy electrically welded steam coils with large heating capacity, strapped in position, connected with the headers outside of the kettle, and fitted with valves and a drainage system. There are no joints inside the kettle.

The pug-mill mixer has a cast iron frame, a steel bottom and a replaceable steel liner plate. It has a capacity of 9 cubic feet, or approximately 1,000 pounds. It is driven by a 20-horse-power engine and operates at 85 to 90 r.p.m. Two steel shafts which carry the blades rotate towards the center, and the finished material is dumped through the bottom directly into the truck for hauling to the job.

The mixer platform is attached to the second unit of transportation. It is easily and quickly erected for operation, being raised by two heavy screws connected to a cross-shaft and bevel gears. When in operating position, it allows a clearance of about 6 feet 4 inches from the ground. The platform carries the bins and screens, weigh-box, mixer, engine and asphalt bucket. The hot material storage bin, which has capacity for 6½ tons, is divided by partitions into four compartments. It tapers to a cast iron throat fitted with four gates for emptying into the weigh-box. The large revolving cylindrical screen which is located in the top of the bin screens and separates the material.

The 70 horse-power boiler is of the horizontal type, and operates at 150 pounds pressure. It is equipped with an injector for feed and with a pump for returning the condensation from the coils to the boiler. The fire-box is arranged for, and equipped with, an oil burner as well as with grates for coal. One 20-horse-power engine drives the mixer and an 8-horse-power engine drives the drum and elevators. There are three elevators, two for cold and one for hot material. All are

equipped with 8- x 5-inch malleable buckets, set 12 inches apart on a detachable link chain. The two elevators for cold sand and stone are located at the feed end of the drying drum. The elevator for hot material is enclosed in a telescopic steel housing and carries the material from the drum to the screen, into which it discharges through an adjustable chute.

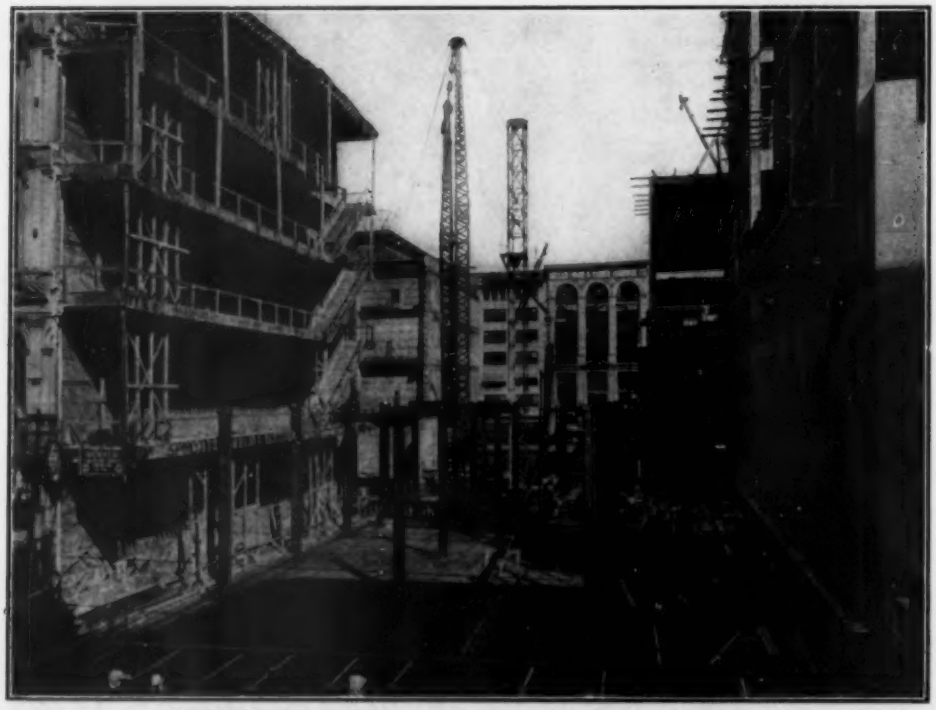
Building-Jobs in St. Louis

Contractors Use Labor-Saving Equipment in Concrete Work

IN the construction of the $8,000,000 Nugent Department Store in St. Louis, the Wimmer Contracting Company is using a full line of labor-saving equipment. The illustration below shows but a small section of the job, as the new building is being built around the old building and when the present work is completed the old building will be wrecked and the new structure will be put up in its place. The tower in the background is an Insley steel tower quick-shift counterweight chuting plant which was bought by the Wimmer Contracting Company from The Geo. F. Smith Company of St. Louis. The derrick in the foreground is a 15-ton Insley steel-erectors' derrick with a 100-foot boom. There are two of these derricks on the job, but only one of them is shown in the photograph. The derricks are being used by the St. Louis Steel Erection Company, which has the subcontract for putting in the structural steel.

The building on the right is the Federal Reserve Bank Building, which is just being completed. The Westlake Construction Company, of St. Louis, are the general contractors and are also using an Insley steel tower quick-shift counterweight chuting plant.

The Wimmer Contracting Company on the Nugent job is also using a 7 x 10 Clyde double-drum, double-cylinder steam hoist for operating the plant. Another subcontractor, the Lotz Construction Company, which had the contract for the caisson work on this job, used three 7 x 10 Clyde double-drum, double-cylinder steam hoists which were rented from The Geo. F. Smith Company. The Wimmer Contracting Company also purchased its hoists from The Geo. F. Smith Company.



INTERESTING BUILDING CONSTRUCTION SCENE IN ST. LOUIS

May 1925 Be Prosperous and Healthful for Contractor, Distributor and Manufacturer.

Small Dump-Cars on Highway Work

Record of 32,000 Yards of Material Handled in First Month of Operation

NELSON, FULTON & NELSON in the early summer of 1924 were awarded a grading contract on State Highway Project 30-24, which is Federal Aid Project No. 334, Section 1, from Detroit to Shoreham, Minn., totaling 113,000 yards. There are several unusual features connected with this job which are proving of more than casual interest to contractors and others interested in construction work. In the first place, a ¾-yard Erie shovel equipped with a 1¼-yard sand bucket is loading the sand. This is something entirely new in this territory, and is proving very successful in every way, and the increased yardage is exceedingly profitable. To serve this shovel, two trains of 15 cars each of the 1½-yard Western type are being used, pulled by two 7-ton Plymouth gear-drive engines, equipped with Climax motors. It is not unusual to see Western cars in this kind of service, but it is unusual to see cars that are approximately 15 years old overloaded with 1¾ yards and standing up under such severe service. The Plymouth engines pulling these cars are of the heavy-duty type, and the heavier Climax motors would permit of the dinkeys' handling 25 cars in a train, in place of fifteen, if necessary.

The job was started May 28 and during the first month approximately 32,000 yards of material was handled. The extreme haul is about 3,000 feet, and the total amount of trackage is 1½ miles of 20-pound steel. As an example of the efficient manner in which the job is being handled, one 12-car train was loaded in 8 minutes and 45 seconds and the shovel moved up only twice, averaging nearly four swings with the bucket per minute. The next train was loaded in ten minutes with approximately the same average.

Between 800 and 1,000 1½-yard cars are being loaded each day, and on the best day 1,010 cars were loaded. These cars are carrying 1¾ yards of material, and the engineer is giving them their yardage, so it is official. During one run of three days recently, 2,806 car-loads were handled, or 4,910 yards in three days, averaging 1,636 yards per day. The locomotives are burning 12 gallons of gas per 10-hour day and use 3½ gallons of lubricating oil, which is changed every week. They are using 8 quarts of water per

PUSHING WORK ON THE NELSON-FULTON-NELSON ROAD JOB NEAR DETROIT, MINN.
These contractors are using an Erie steam shovel, Plymouth locomotives, and Western dump-cars furnished by the William H. Ziegler Company, Inc., Minneapolis, Minn.

week, or about one-half a pail. The maximum grade is approximately 3 per cent.

This job is under the direction of Walter Nelson, with Peter Wallom as Superintendent. William J. Russell is the Erie steam shovel operator, and the firing is being done by Joe Campbell. D. E. Murphy is handling the office end for Nelson, Fulton & Nelson, and A. E. Fredell and William Beaver are the dinkey operators. The work is under the direction of State Highway District Engineer A. C. Torgenson. Early completion of this job is in sight on account of the amount of yardage being handled daily by effective material-handling equipment.

A New Subgrade Planer

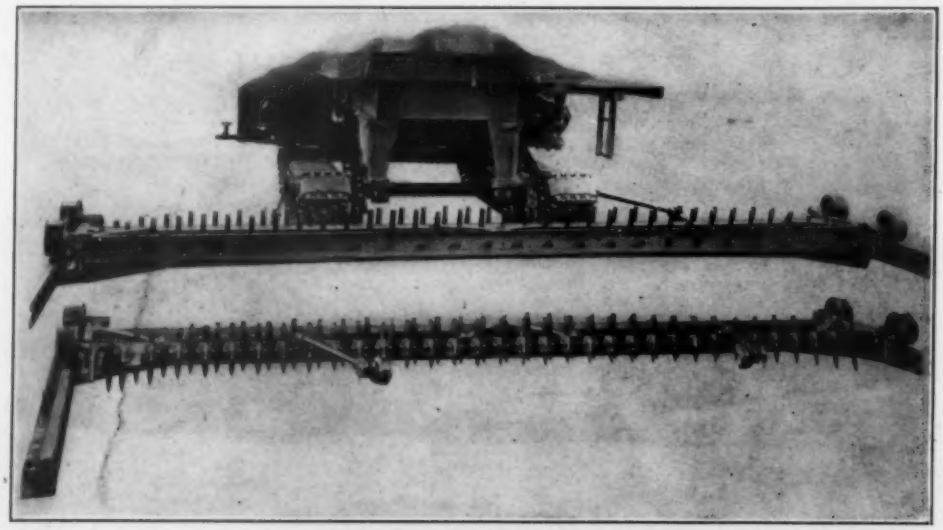
Machine Makes Concrete Road Work More Economical by Cutting Down the High Spots and Filling in the Low Places

THE new subgrade planer made by the Koehring Company, Milwaukee, Wis., is designed to finish off the subgrade just before placing the concrete. It consists of a scarifier and a blade scraper spaced about 12 inches apart. The planer is supported on the road forms by two small wheels on each end, and is automatically moved along by the paver. The scarifier teeth are set a little below the scraper blades, causing the high spots to be cut off and leaving the surface in such a condition that it can be scraped off to a true smooth surface by the scraper. The loose dirt which is retained by the scraper blade fills in the low spots, leaving a surface conforming to accurate grade.

In light soil, the planer will grade efficiently to a depth of 2 inches, but it is not designed to work in hard clay or in an old macadam road-bed or one which has shale or rock imbedded in large quantities. Draw-bars with special hub caps are provided for attaching the planer to the paver. The machine may be placed either at the rear under the discharge chute or in front directly back of the charging skip, but it performs to best advantage in the former position.

In operation, the ground men or spreaders mount the planer to give added weight, and with ordinary ground conditions, the grade is accurately established while the mixer moves ahead. When the soil is hard, the operation can be quickly repeated by backing up the mixer and going over it the second time if necessary. Sufficient loose soil or sand should be kept between the rooter teeth and the blades to fill in the low spots.

Since all the machines are adjusted before leaving the plant, the contractor should know the cross-section of the road and should have decided whether the planer is to be used at the charging or the discharging end of the paver. The machine is adjustable to all present heights of crown and is built for roads of 16-, 18- or 20-foot width. The weight of an 18-foot machine complete with draw-bars is 1,410 pounds.



VIEWS OF NEW SUBGRADER ATTACHMENT

Above: Subgrader attached to mixer. Below: Subgrader attachment as seen from the mixer side, showing arms for attaching to the mixer frame

A New Road Truck with Short Wheel-Base

Machine with Standard Equipment Capable of Road Speeds of 35 Miles per Hour

THE United Road Constructor, a new motor truck having a double reduction type axle, a short wheel-base and a body of unusual design, is manufactured by the United Motors Products Company, Grand Rapids, Mich., for road contractors and general construction engineers. The chassis is powered with a 4 x 5 Hercules engine with full-force oiling system, with Brown-Lipe 3-speed transmission and clutch in a unit. The rear axle is of the double reduction type with special rear springs for this class of service. The rear springs are of the platform type with offset side springs. Placing the axle off center on the springs gives a different load distribution from that obtained with the conventional semi-elliptic type. It also permits the use of a shorter wheel-base and a reduced turning radius.

ROAD BUILDERS' TRUCK WITH DIVIDED BODY AND CEMENT BIN

The body has a width of 40 inches at the front and 48 inches at the rear to permit the easy discharge of wet materials. A center swinging partition is provided for separating the sand and gravel, and cement is carried in the tail-gate, which is of the hopper type construction. This isolates the cement from the other materials, which may be wet, and thus prevents it from becoming wet and caking in the body. Regardless of the quantity of water contained in the sand and gravel, it cannot enter the cement compartment. Both the cement and the aggregate are discharged from the rear end when the tail-gate latch is tripped.

By substituting a standard tail-gate for the cement hopper and removing the center partition, the body may be used for general hauling work. The body has a capacity of 1½ cubic yards, and the hoist is of the Wood hydraulic underbody type.

The standard equipment of this truck is a seat, tool-box, magneto ignition, Zenith carburetor, and oil lights. The tire equipment is 32 x 6-inch heavy-duty truck type pneumatic tires on disc wheels.

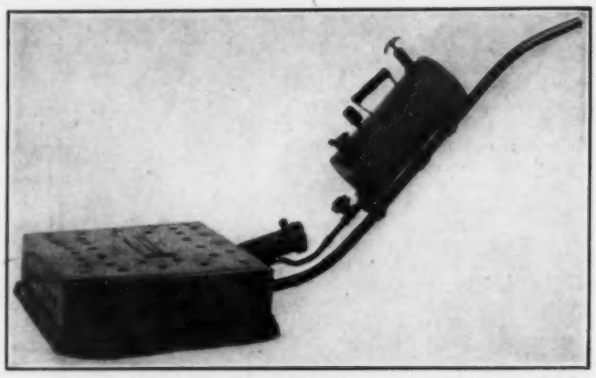
INSLEY EXCAVATOR WITH SHOVEL ATTACHMENT USED FOR STREET GRADING IN LA CROSSE, WIS.

This machine, owned by E. H. Derr, La Crosse, Wis., has been in operation for over five months, during which time it has handled an average of over 400 cubic yards each working day. Mr. Derr has recently completed one job, containing 12,000 cubic yards, in 25 working days. Earlier in the season he handled a job containing 5,077 cubic yards in 90 hours. The various cuts ranged from 18 inches to 13 feet in depth

A Machine for Forced Bleeding of Creosoted Blocks

Machine Brings Tar and Asphalt to Surface without Burning

THE forced bleeding of tarred or creosoted block floors or pavements, or the ironing out of bituminous floors or pavements, is the purpose for which a new device has been recently produced by the Chausse Oil Burner Company, Elkhart, Ind. This machine is a large, flat iron or squeegee, equipped with a kerosene burning torch, which has shown itself to be successful in the treatment of floors. While it was designed primarily for repair work in softening floors and pavements, it was found also to be adaptable to new work where any warming effect is desirable. It has also been used in warming concrete floors which are to be covered by wax or resin before painting, and binds the material to the concrete so that the paint does not peel.



A MACHINE FOR BLEEDING CREOSOTED WOOD BLOCK PAVING AND FLOORS

In spite of the intense heat produced by the torch, it will not burn block or asphalt and will only brown paper because the heat is so well distributed over the pavement. The machine brings tar to the surface so that it may be scraped off and warms asphalt so that it can be rolled or tamped. It is not intended for the type of street repairing now done by surface heaters. The torch furnished is a standard 3-gallon Chausse kerosene torch which may be detached for other uses and carries sufficient fuel for 3 hours' continuous operation, which is ample for many jobs.

CONSTRUCTION SCENE ON THE NEW UNIVERSITY OF MINNESOTA STADIUM

James Lock & Company, Minneapolis, Minn., general contractors for the University of Minnesota stadium, purchased a Wonder No. 14 mixer and mounted it on rollers so that it could be moved around the job ahead of the main mixing plant. Materials were delivered to the mixer by Ford trucks from the main material bin in the background. The mixer track loader with its extension feeder enabled the trucks to charge the loading hopper on the ground. This outfit was sold by William H. Hale & Company, Minneapolis, Minn.

Strengthening a strong line—the New 5-ton "Caterpillar"

Some Special Features

Simplicity with increased efficiency, obtained through careful engineering.
Low center of gravity—a compact tractor, the length, height and width correctly proportioned to its weight of 10,400 lbs.
Three unit construction, viz: Motor unit, transmission unit, track unit.
Complete accessibility combined with fullest dirt-proof protection.
Holt valve-in-head motor, fully enclosed, with gear driven fan and pump, with ample reserve power.
Full force feed oiling system insuring perfect lubrication on the steepest grades.
Correct flexibility of tracks is obtained through a proper pivoting track release, full three point suspension and spring mounting, insuring maximum traction under all conditions.

A good product made better—that describes the New 5-ton "Caterpillar" (Oruga). It incorporates all the efficiency and superior qualities continuously displayed in the 5-ton "Caterpillar" since 1917; and it possesses new qualities and mechanical features exclusively Holt, unapproached by any other make or type of tractor.

The New 5-ton "Caterpillar" is a product of experience; thoroughly tested by Holt engineers and users under the most gruelling conditions.

Here, then, is a complete line of outstanding quality in power equipment—the New 5-ton "Caterpillar" for all medium power needs; the 2-ton, rugged and agile for the lighter tasks; the great 10-ton, supreme in all heavy duty fields.

Experienced engineers and contractors in all parts of the world have found "Caterpillars" the most efficient, the most dependable tractive power. Wherever there is need for the utmost in rugged power, positive traction and lasting quality, "Caterpillars" deliver satisfaction, save time and reduce costs.

Our new booklet contains interesting information about the 2-ton, 10-ton and New 5-ton "Caterpillars." Copy will be sent upon request.

The Nation's Road Maker

There is but one "Caterpillar"—Holt builds it.

THE HOLT MANUFACTURING COMPANY, INC.
PEORIA, ILLINOIS **STOCKTON, CALIF.**

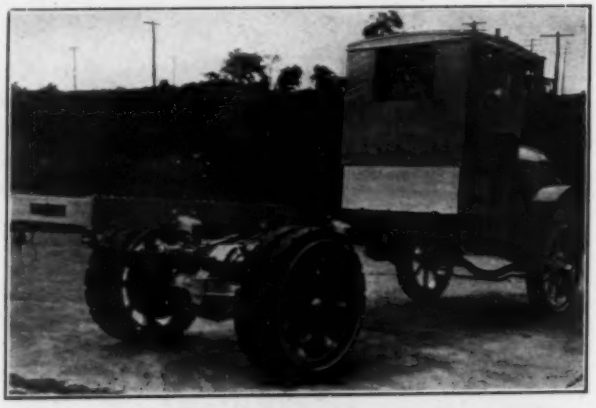
Export Division: **200 W. 54th Street, N. Y.**

CATERPILLAR
Reg. U.S. Pat. Off.

Features of New Road Builders' Truck

Machine Designed Especially to Meet Requirements in the State of California

A NEW Bethlehem seven-speed "California Special" motor truck has been designed by the Bethlehem Motors Corporation, 40 East Walnut Street, Allentown, Pa., and has been based particularly on the road-building requirements in the state of California. The frame and undercarriage portions are built extra strong to withstand the constant abuse of contracting and road-building work.



CHASSIS OF NEW BETHLEHEM ROAD-BUILDING TRUCK

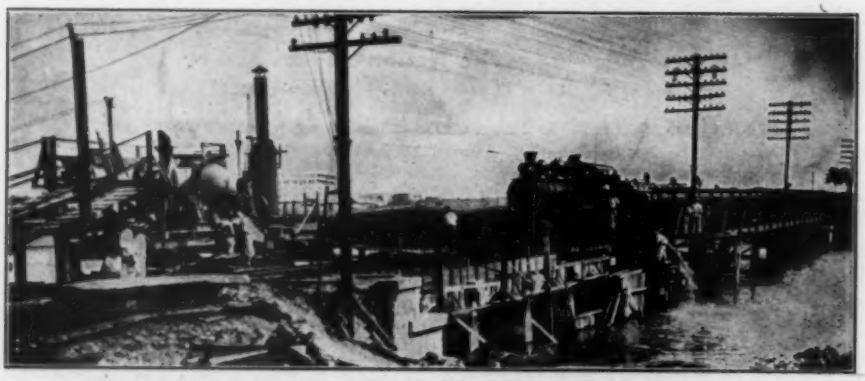
The engine is a 4-inch bore, with 5¼-inch stroke, 4-cylinder of standard Bethlehem design and manufacture, coupled with a Brown-Lipe seven-speed transmission and multiple dry-disc heavy-duty clutch. Spicer drive-shafts are employed both between the clutch and the amidship transmission and between the transmission and the rear axle. Four universal joints coupled with 2¼-inch outside diameter tubing constitute the shafts.

The rear axle is the heavy-duty Wisconsin Parts Company's double-reduction type model 120-FG, attached to the frame in the Hotchkiss manner, eliminating tort and needless weight. The springs are of chrome vanadium steel. The shackles and leaves are lubricated through patented magazine oilers. These trucks are very liberally tired, having 36 x 6 dual Kelly Kats on the rear, and 36 x 6 singles on the front. Smith steel wheels are used on this model.

The small engine, together with the large range of speeds through the seven-speed transmission, makes possible a comparatively light chassis capable of carrying very heavy loads with maximum economy. The high-gear ratio is approximately 8 to 1 and the lowest-gear ratio 98 to 1 This large reduction in low gear makes it possible to climb a very steep incline and get traction under the most difficult hauling conditions, according to the manufacturers.

Some of the other features of this truck are the electric lights and the self-starter, with a separate source of electrical energy, supplied for ignition purposes by the new Bosch AT-4 third edition magneto. The engine is cooled by a Busch tubular radiator protected with a special reinforced core face guard, the whole of which is mounted in a heavy armored tank. In addition to this, a wrought-iron radiator guard of exclusive design is placed on the front of the chassis.

The idea of producing a dump chassis and keeping its weight down to a minimum, follows the trend to lighter weight in chassis design, elimination of dead weight, and the meeting of the increasingly rigid weight requirements in almost all states.



THE RECONSTRUCTION OF SAN ANTONIO BRIDGE, SAN JUAN, PORTO RICO

This illustration shows the T. L. Smith mixer and Novo-driven Gould pump dewatering a caisson—all Yankee construction machinery, which is used so extensively in Porto Rico

Announcing

a new product
of the
Hughes-Keenan Co.

a 2-3 yard
DUMP BODY
extra low mounting
underbody power hoist
quickly installed on any
truck at a surprisingly
low price...

See Exhibit N313
Main Floor
New Coliseum

The
HUGHES-KEENAN Co.
MANSFIELD OHIO

Nine- to Fifteen-Ton Gasoline Locomotive

Economical Unit for Transporting Material in Stone Quarries, Sand and Gravel Pits and for Road Building and General Construction

IN its Type H gasoline locomotives, the Milwaukee Locomotive Manufacturing Company, Milwaukee, Wis., has brought out a series of dependable units for industrial railway hauling on contracting projects. These locomotives are made in 9- and 10-ton sizes with track gages of from 24 to 56½ inches. The Type H 15-ton locomotive is built for track gages of from 30- to 56½ inches. These locomotives have inside wheels, which have many distinct advantages over outside wheel construction as regards safety and utility.

The frames of the largest size are made of cast steel open bars with reinforced channel-iron end sills. The draw-pocket castings are made of cast steel and are of the open bar type with link and pin or standard M.C.B. couplers.

The locomotives are equipped with electric lights and starters to make it possible to put them into operation quickly and to operate at night where necessary. The engines of all Type H Milwaukee locomotives are designed to operate on gasoline, which is claimed by manufacturers to be the most economical and satisfactory fuel for this type of work. If, however, the locomotive must be operated on kerosene, alcohol or distillate, special equipment is required, which can be furnished. All bearings, except those of the engine and transmission, which are automatically lubricated, are equipped with Alemite grease fittings, providing quick and efficient lubrication.

A 15-TON GASOLINE LOCOMOTIVE EQUIPPED WITH STANDARD COUPLERS

The 15-ton locomotive complete, ready for service, weighs approximately 30,000 pounds and operates at 2, 4, 6 and 12 miles per hour at the governed engine speed of 1,000 r.p.m., the engine delivering 115 horsepower. The draw-bar pull on level track with sand is a maximum of 13,500 pounds. It has a gear drive with two heavy roller chains from the transmission drive-shaft to each axle. The wheels are rolled steel and 30 inches in diameter. The haulage capacity at 30 pounds resistance per ton varies from 235 gross tons of 2,000 pounds at 2 miles per hour on the level to 9 gross tons at 12 miles per hour on a 6 per cent grade.

A New Wheel Equipment for Fordson Loader

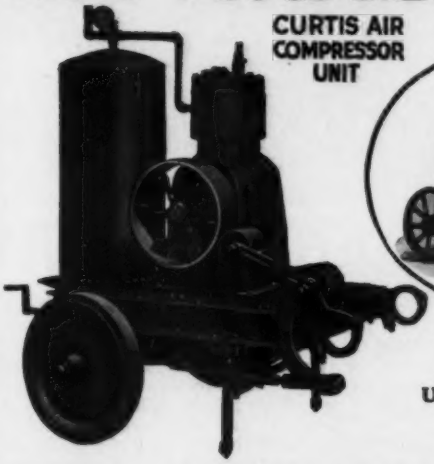
Improvement Makes It Possible to Propel Loader into Pile While Elevator Is in Action

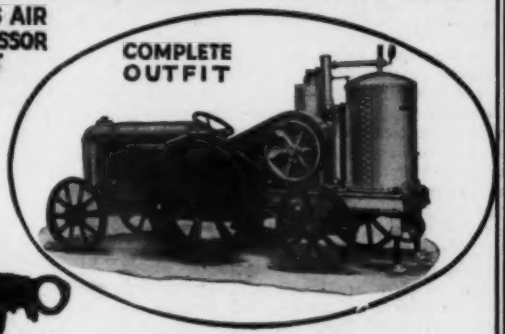
HAISS-FORDSON LOADER WITH NEW POWER TAKE-OFF

THE George Haiss Manufacturing Company, 142nd Street and Park Avenue, New York City, has recently brought out a new wheel equipment for Fordson loaders which varies from the old type, inasmuch as this loader can be propelled into the pile while the elevator is in action. This is obtained by installing a cast steel take-off box between the fly-wheel and the clutch of the Fordson tractor. The tractor is disconnected in the center by taking the bolt out of the fly-wheel house and installing the Haiss take-off box and attaching the rear end to the box. This puts the clutch in back of the take-off, so that when it is desired to propel the machine into the pile, the elevator clutch is not disconnected.

Better and More Service
Our 1925 Motto

CURTIS-FORDSON AIR COMPRESSOR OUTFIT





Sold as Complete Outfit or Unit Can be Bought Separately

Fills A Much Needed Want

Here is just the thing contractors are waiting for—a portable air compressor unit that operates with any Fordson Tractor, making a complete self-contained outfit. Can be used on a hundred different kinds of jobs where a supply of compressed air is temporarily needed. An outfit that can be moved from job to job quickly by its own automotive power—no extra truck for pulling necessary.

50% More Service

The average contractor can easily get 50% more service out of the Curtis Fordson Compressor Outfit than from the ordinary portable compressor outfit, which is heavy, cumbersome, expensive and serves only a single purpose. It must be remembered that the Curtis Fordson has every quality of the ordinary portable compressor outfit plus the advantages of detaching the Fordson Tractor and using it for all tractor purposes.

Wide Range of Uses

The flexibility of the Curtis Fordson Air Compressor Outfit is remarkable—ideal for the road contractor, structural steel field jobs, oil field work, telephone construction, well drilling, etc. Just the thing to supply air for jack hammer drills, paving breakers, riveting hammers, rammers and tampers, compressed air hoists, sand blasts, stone cutting tools, quarry tools, rivet forgers, clay and coal mining diggers, for pumping water, for washing autos and trucks, unloading tank cars, paint spraying, caulking pipe lines, etc. For city streets can be equipped with rubber tires.

Tractor Used Independently

When the Curtis Fordson is not being used as a compressed air outfit, the Fordson Tractor can be detached and used independently for hauling, loading, moving or power-driving purposes. The coupling is simple—nothing to get out of order or misfit. The whole arrangement is sturdy and practical—the Air Compressor Unit can be attached or detached by anyone in a few moments.

If You Now Have a Fordson

The Curtis Air Compressor Unit can be purchased separately. Used in connection with a Fordson, it opens new fields of work for the tractor and an additional source of revenue for you. You know the reliability of the Fordson—and you know the reputation and dependability of Curtis Air Compressors. The Curtis Unit is backed by 70 years' manufacturing experience, 27 of which have been devoted to the manufacture of pneumatic machinery, and our $1,500,000.00 institution. So you take no chances whatever.

Reasonable in Cost

The Curtis Fordson Air Compressor Outfit can be purchased complete, tractor and all, from us, or the Curtis Compressor Unit can be had separately. Mail coupon for full particulars and prices.

Curtis Pneumatic Machinery Co.
1671 Kienlen Ave. St. Louis, Mo.

1671
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Gentlemen: Please send me full information, your proposition and prices on:
☐ Curtis Fordson Air Compressor Outfit Complete
☐ Curtis Air Compressor Unit Only
I am an authorized Ford dealer, I sell .....cars
Name .....
Address .....
.....

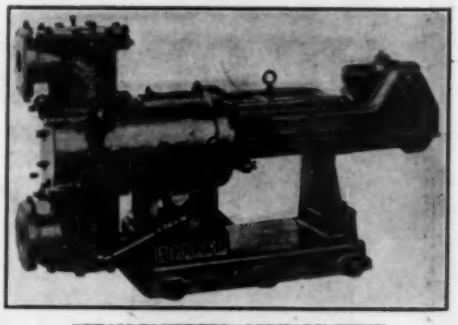
A Steam-jacketed Asphalt Pump

Advantages of Improvements Made to Reduce Usual High Maintenance Costs

THE increasing use of tank cars for the shipment of asphalt has created a demand for a simple asphalt pump with few wearing parts and one that can be operated without skilled attention. After a series of tests extending over a period of one year, the Barber-Asphalt Company, Philadelphia, Pa., is offering the new Iroquois steam-jacketed asphalt pump.

The manufacturers claim that this pump has the following distinctive features which insure long life and economy of operation; a minimum number of wearing parts in contact with the asphalt; large wearing surface to reduce wear; large straight passages for asphalt, instead of narrow, crooked passages; simplicity of construction to insure low cost and maintenance; ease of operation with minimum of attendance; steam jackets covering all moving parts and packing so that the pump can be started or stopped at will without clearing out; accessibility of all wearing parts; and absence of springs or other small, easily broken parts in the valve chambers on account of passing foreign matter, pieces of barrel staves, small pieces of metal, stone, sand, coal or other objects which sometimes get into the asphalt when it is allowed to flow over the ground by careless or too hasty operators.

This pump is of the reciprocating type having a single-acting plunger, which was adopted because it led to simplicity of construction and to placing wear on the plunger rather than on the piston rod. The ball type of valve was adopted because it obviates the necessity of springs within the valve chamber, provides the maximum possible amount of wearing surface, and large and straight passages for asphalt, permits the passage of large pieces of foreign matter, and reduces the number of wearing parts in the valve chamber to a minimum. The valve assembly is so designed that by removing the flange directly over the upper ball, both valves with the seats and cages can be removed through the top of the pump without disturbing any other part of the pump or its piping.



STEAM-JACKETED ASPHALT PUMP

Steam jacketing is one of the essential features of the pump. The steam jackets cover all parts of the asphalt end, including the valve, the plunger and the plunger packing. With steam in the jackets, the pump can be stopped for an indefinite period without the necessity of blowing out or otherwise removing the asphalt in the pump chamber. The asphalt may be allowed to cool and solidify in the pump chamber, and the pump may be started again by filling the jacket with steam until the asphalt is liquid.

The Iroquois steam-jacketed asphalt pump is furnished in three sizes, of 50, 100, and 200 gallons per minute. The materials entering into the construction of the pump are as follows: the steam cylinders are of close-grained iron; the piston rod is of steel; the plunger is of close-grained gray iron; the two ball valves are of bronze and are hollow; the asphalt valves and cages are of cast iron; the valve cage separator is of cast steel. All steam-jacketed parts are of special cast iron, tested with 150-pound hydraulic and 175-pound steam pressure in the jackets.

Miscellaneous Notes

New Osgood District Sales Manager

THE Harnischfeger Corporation, Milwaukee, Wis., has announced the appointment of H. L. Mode as a sales representative in New York District, with offices at 50 Church Street, New York City. Mr. Thompson has had wide experience in the excavating machinery and contracting field, and is well qualified to look after the interests of users of excavating machinery.

New P. & H. Representatives

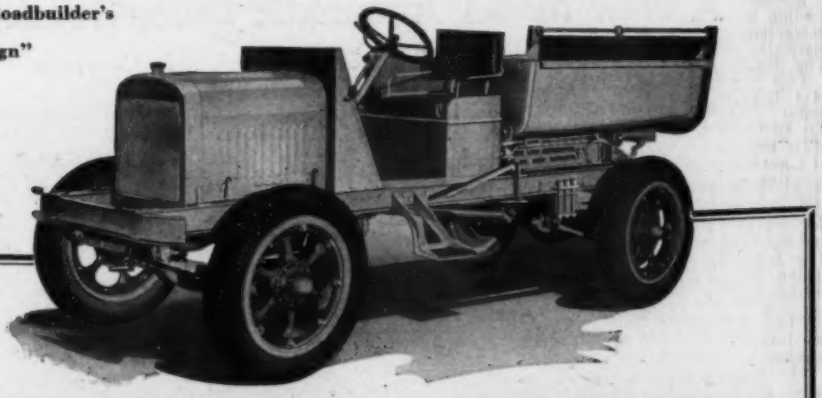
THE Harnischfeger Corporation, Milwaukee, Wis., has announced the appointment of H. L. Mode as a sales representative in the Eastern territory, with headquarters at New York and Philadelphia. Mr. Mode has had ten years of experience with overhead electric traveling cranes as well as seven years' experience in the motor department of the General Electric Company. He will specialize in problems of electric traveling cranes.

The appointment of N. P. Farrar as Assistant Sales Manager has also been announced. Mr. Farrar has been District Manager of the Philadelphia territory until recently and has had considerable experience with overhead electric traveling cranes, hoists and gasoline-powered excavators.

Union Water Meter Opens New Office

THE Union Water Meter Company, Worcester, Mass., has opened a New York office at 452 Hudson Terminal Building, 50 Church Street, New York City. Edward W. Jacobs, for the past ten years representative of this company in the New York territory, will be in charge. The Union Water Meter Company was organized in 1868 and manufactures water-meters of several types, compounding valves, stops, presses for lining service pipe with cement, etc.

"A Roadbuilder's Own Design"



HUG PRACTICAL EQUIPMENT

Provides Speed and Profits

The per ton-mile cost of your hauling equipment is the final test of its value. When you try to crowd makeshift equipment with the extra tonnage necessary for that increased yardage that spells the difference between profit and loss on the job, it all too frequently fails when you need it most—and breaks down under the added pressure.

Hug Roadbuilder Trucks and Hug Camroller bodies are built to keep the mixer always going. Through their special features, designed by a practical roadbuilder, they save time where other trucks lose it; save gasoline where other trucks need help. But, most of all, they meet the most exacting demands with the strength and endurance that makes their low operating cost records a matter of direct profit to every HUG owner. The more work they have to do in a day, the lower becomes their ton-mile hauling cost for the day. When you crowd the job the hardest, the efficiency of HUG Trucks is made most apparent. For the Roadbuilder, there is no other truck as good as the new one and two Batch HUG Roadbuilder Models.

HUG TURNTABLES AND SUBGRADE PLANERS

The New Hug Turntable is turned speedily by one man. It is substantially built yet light, can be moved from place to place by two men; it turns inside the forms of an 18 ft. subgrade.

The Hug Subgrade Planer trims the subgrade true to specifications. By eliminating guess work, it saves concrete. A crank axle and wheels provide easy transportation.

Complete data and specifications sent on request.

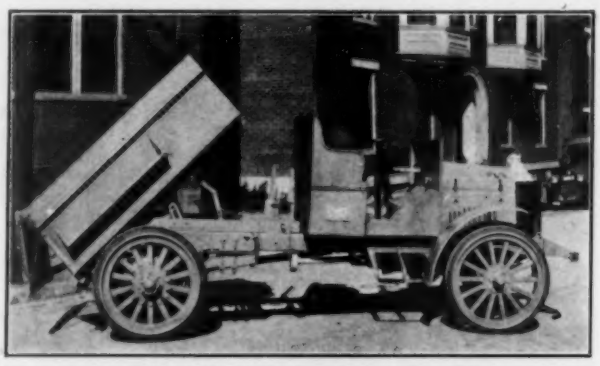
The Hug Company
Manufacturers

HIGHLAND, ILLINOIS

A New Model Automatic Dump-Truck

Motor Truck Manufacturer Brings Out Complete Unit for Contractors

A NEW model dump-truck adapted to road work, excavating or any kind of work where short turns and quick action are advantageous, has been placed on the market by the United States Motor Truck Company, Cincinnati, Ohio. The truck dumps its load automatically by releasing a lock and pulling a lever. When the load is dumped, the body is returned to loading position by the same lever movement. The tail-gate is automatically locked and unlocked. The dumping angle is 50 degrees.



A SHORT WHEEL-BASE MOTOR TRUCK WITH EFFICIENT DUMP BODY

This truck, known as the Model ND dump-truck, has a 4-cylinder motor with removable head and hot spot manifold. It develops 35 horse-power at its working speed of 1,400 r.p.m. The transmission is selective sliding gear with three speeds forward and one reverse. All of the gears and shafts are heat-treated chrome nickel steel. The steering gear is of the semi-irreversible worm and split nut type with an 18-inch steering wheel. The frame is of pressed steel with hot riveted spring hangers and cross-members. The front springs are semi-elliptical with bronze eye bushings and the rear springs are quarter elliptic. There are two springs on each side, and the rear springs are interchangeable in any of the four positions, making maintenance easier.

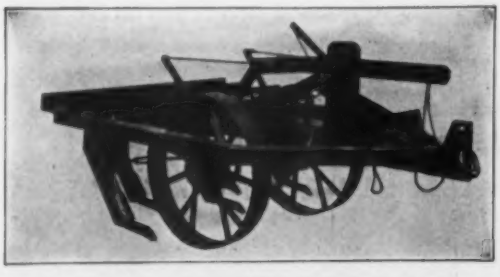
The front axle is a drop-forged I-beam with taper roller bearings, and the rear axle has an internal gear ratio of 30.4 to 1 first speed, 12.9 to 1 second speed, 7.6 to 1 third speed, and reverse 26.6 to 1. The truck is capable of making 5.3 miles per hour in first speed, 12.5 in second, and 21.2 in third, with 6.1 miles per hour in reverse.

The front wheels carry 36 by 4-inch solid, or 35 x 5-inch pneumatic tires; the rear 36 x 6-inch solid, or 38 x 7-inch pneumatic. The solid tires are standard equipment. The wheels are of the artillery type. The general dimensions of the truck are 170 inches long over-all, frame width 34 inches, width over-all 68½ inches, height from ground to top of frame 31 inches, wheel-base 113 inches, body length 6 feet, body weight 700 pounds, body capacity 1¼ cubic yards.

A New Power Lift Scarifier

Manganese Steel Teeth and Heavy Frame Are Features

AN entirely new type of scarifier which the manufacturers, the Spears-Wells Machinery Company, Oakland, Calif., claim embraces several novel and important features, has been brought out under the name Spearwell-Dinuba power lift scarifier.



A STEEL-WHEELED SCARIFIER WITH MANGANESE STEEL TEETH

This scarifier is designed and constructed for heavy duty with tractors having from 15- to 30-horse-power draw-bar pull. It is made entirely of steel and has five cast manganese teeth set into heavy cast iron standards mounted on a strong frame of angle steel thoroughly reinforced against excessive strains. The teeth cut 5 feet wide and 8 inches outside of the wheels. The adjustable power lift is of simple design, is positive and rapid-acting, is said to be easy to operate, and is dependable. It has very few working parts, and those which are subject to wear can be easily and cheaply replaced.

The heavy, hand-made steel wheels have been specially designed for hard usage. They are 34 inches in diameter and have 6-inch heavy steel tires. The axles are of the bell crank type, 2½ inches in diameter, and are fitted to the wheel hubs with removable boxes. This makes an outfit that is sturdy and suitable for its work without excessive weight.

A GREAT SAVING TO YOU

Testing foundation of Lake Street Bridge, Chicago, with one of our BR drills.

USE Standard Diamond Core Drills for testing underlying stratas. These drills bring up cores each 10 feet as you drill deeper.

The use of Standard Diamond Drills will enable you to intelligently specify the proper foundation. These drills have been used extensively by National, State and Municipal Governments throughout the entire world.

For complete information write for our booklet No. 6.

STANDARD DIAMOND DRILL CO.

CHICAGO First National Bank Building, ILLINOIS

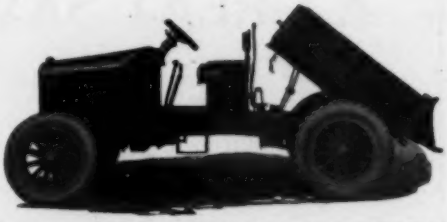
Works at McHenry, Illinois

A Special Truck for Road Construction Work

New Model SD Has Special Features

THE new model SD chassis made by the International Harvester Company of America, 606 South Michigan Avenue, Chicago, Ill., is especially designed for road work in connection with the rear gravity-dump type of body. The rear springs are of the cantilever type, 2½ inches wide with 14 leaves. Liberal size radius rods further strengthen the rear construction, so that the truck is able to stand up particularly well under the rough usage to which it is subjected in road construction work. The rear axle of this special truck is of the internal-gear type and consists of a special drop-forged steel member for carrying the load and separate live driving axles for transmitting the power to the rear wheels.

The steering gear is set at an angle which enables the driver to sit comfortably and naturally. The clutch and foot brake in the Model SD International motor truck are set inside at the cowl at proper angles, making them easy to operate, with sufficient foot and leg room to insure comfort for the driver.



THE NEW INTERNATIONAL ROAD-BUILDERS' TRUCK

The power-plant of this truck is a 4-cylinder engine of the block cast L head type, built to meet the particular requirements of a truck that performs heavy-duty service at rapid speeds.

A New Model Blast Hole Drill

Outfit Equipped with Crawler Tractor Wheels for Contracting Service Where Traction Surface Is Necessary

THE newest Loomis "Clipper" blast hole drilling outfit is equipped with crawler type traction rear wheels, supplying the need for a machine required to go over soft ground or where a wide and long traction surface is desired. This outfit, made by the Loomis Machine Company, Tiffin, Ohio, is so constructed that the weight applied to the crawler wheel is distributed over a large surface, thus greatly avoiding the "digging in" when power is applied to push the machine forward. It also eliminates "wallowing" when striking a mud-hole.

BLAST HOLE DRILL WITH CRAWLER TRACTOR WHEELS

The blast hole drill outfit has a slow speed for use when crossing bad and soft places, and a faster speed for ordinary travel. Aside from this, it has a variable-speed engine which can be run at such suitable speeds as may be desirable on either the low or the high gear. The new type "Clipper" blast hole drill has a new style patented and improved loose crank which starts and stops the tools instantly by the mere push of a lever. It has patent wheel rests and a patent rope saver, and the manufacturer states that the entire outfit is simple, durable, effective, easily and cheaply maintained, easily operated, and built with a low point of gravity.

A Creeper Path-Digging Truck Loader

New Engine with Special Features Increases Power

THE Haiss creeper path-digging loader made by the George Haiss Manufacturing Company, Inc., 142nd Street and Park Avenue, New York City, is now equipped with a 37-horsepower Waukesha engine with a Ricardo cylinder head which diffuses the gas, increasing the power of the engine. The creeper treads have been increased in length, so that they now have a bearing pressure on the ground of only 8½ pounds to the square inch, and the total weight of loader is 14,000 pounds.

The guards on top of the elevator have been increased in size to prevent material from falling on the operator. All bearings are equipped with Alemite lubrication, and the clutches have been increased in size, running in a bath of oil. The creeper tread links have been redesigned, so that it is impossible for mud or dirt to wedge between them. The feeding propellers have been made heavier, and the elevator length has been increased to give a higher discharge height into motor trucks and wagons.

Buy **STANDARD** Tools in **SHOVELS** It's **AMES**

When you spend **.05c.** for chewing gum you insist on your favorite brand.

When you go to purchase a new motor, whether for

$500 or $5,000

You know what you want and you get it.

WHY should you be less careful in your buying of shovels?

You can't go wrong on

"O. AMES" SHOVELS

The World's Standard Shovel for 150 Years

Distributed throughout the United States by the foremost dealers only

AMES SHOVEL AND TOOL COMPANY
BOSTON, MASS.

Unbranded Tools and Equipment "Disappear" Long Before They Wear Out

YOU lose tools and equipment on nearly every job due to intentional or unintentional theft. Your tools get mixed up with others and the contractor with the easiest conscience comes out ahead.

Therefore

You have long felt the need of an inexpensive branding iron like the Everhot for quickly branding tools, sheeting, wheelbarrows and other equipment.

The torch of the Everhot branding tool keeps heating the brand all the time you use it, so it stays hot and brands continuously. It was designed especially for contractors' use in protecting their equipment.

Everhot equipments are priced as low as $14.00.

Write for descriptive circular.

EVERHOT
America's Brand Makers
MANUFACTURING CO.
Maywood, Ill.

See us at Booth B-R59 at the Convention of the American Road Builders' Association.

A New 5-Ton 4-Cylinder Gasoline Road Roller

New Pony Roller with Fordson Power-Plant a Handy Piece of Road Machinery

ANOTHER well-designed gasoline road roller using the Fordson power-plant has been placed on the market for highway departments and contractors. This Pony roller, made by the Acme Road Machinery Company, Frankfort, N. Y., makes a one-man job of maintenance work and replaces several men, teams and different pieces of equipment with a single piece of machinery. The machine, with its planer attachment in front and scarifier attachment at the rear, as well as its three rollers, is adaptable for scarifying, leveling and rolling old roads and in the preparation of subgrade on new construction, as well as for compacting embankments. Several contractors have found this machine better adapted than the tandem roller for cross-rolling asphalt pavements, because, they claim, it is very difficult to get an experienced operator who can cross-roll successfully with a tandem roller, while with this three-wheel machine there is no trouble in keeping a perfect balance.

The Acme Pony roller consists of a heavy steel frame which takes all the strain and carries all the attachments. The Fordson power-plant is simply mounted on the unit to furnish the power. It is possible for 2 men in 2 hours to remove the Fordson unit in case it is desired to use it in other work. All of the controls for the roller and the attachments are within easy reach of the operator. The rear wheels have a special device for locking both rolls, thus making it possible to stop the machine quickly and prevent the accidents which have occurred to flagmen going ahead of steam rollers.

THE ACME GASOLINE ROAD ROLLER

The planer attachment, which is carried by the frame and individually controlled by the operator, can be adjusted to any desired position. Material can be scraped from right to left or from left to right, or the planer can be set at an angle for trimming shoulders, and by use of an extension the blade may be made to reach the toe of the slope for cleaning ditches. Another adjustment permits it to be tilted for cutting or leveling. The scarifier attachment which automatically operates at the proper angle is forced into the pavement by heavy springs. The standard equipment includes a set of scrapers for the road, a complete set of picks for the rear wheels, the brakes and scarifier attachments.

A Keyed Asphalt and Concrete Paving Block

New Block Combines Advantages of Both Paving Materials

THE Keystablock, which is a monolithic asphalt concrete paving block having a bitumen percentage of 12 per cent with a penetration at 77 degrees up to 110 and a mineral aggregate of balanced composition to meet traffic requirements, has been placed on the market by the Keystabond Asphalt Paving Company, Inc., 367 Boylston Street, Boston, Mass. The standard Keystablock paving block measures 3½ x 4 x 12 inches.

These blocks obtain their lateral strength from an undercourse of concrete securely keyed or bonded to the asphalt wearing course. They are made by forcing the asphaltic material into this bond by hydraulic pressure. In this way, the asphalt surface course cannot creep or wave under traffic or climatic changes.

The keystones are about one inch in diameter and are coated with bitumen. The top surface is pressed into this and the remaining half of the voids filled with concrete. These blocks can be manufactured anywhere that the required grade of sand or crusher screenings may be secured. This makes it possible for a contractor or a city having an asphalt plant to operate twelve months a year, reducing the overhead caused by the usual five or six months' shutdown.

The Keystablock asphalt paving block can be laid by any paver, as it is uniform in size and is laid the same as brick or wood block on concrete, macadam or sand and gravel foundations. The blocks can be made in various depths so that they can be used for patching wood block, brick or sheet asphalt paving at any season of the year. They are particularly adaptable for use with asphalt paving along street-car rails where neither concrete nor asphalt alone has been found satisfactory.

When considering purchases of Contracting Equipment look over the complete "Where to Purchase" directory at the front of this magazine, as well as the Index to Advertisers.

15-Year's Growth of the Original WONDER Idea

a single opening Tilting Mixer

In 1910—One small size mixer.

In 1925—Five sizes ranging in capacity from 3 to 14 cubic feet per batch.

In 1910—One model only.

In 1925—Twenty-five models.

In 1910—6,000 square feet of factory space.

In 1925—80,000 square feet of factory space.

In 1910—A general office and sales force of five people.

In 1925—A general office and sales force of fifty people and three district offices.

In 1910—Not one distributor.

In 1925—National distribution thru seventy-five representatives with stocks and service.

In 1910—Five or six contemporaries building non-tilting and continuous type mixers.

In 1925—Dominance of this type, and a score of mixer manufacturers adopting it.

There is a certain pride in being the *originator*. However, to pioneer the *original*, and always lead in reaching the highest point of improvement of the *original*, is the real achievement.

On the 15th Anniversary of WONDER, we, the originators, with fifteen years of unbroken leadership, offer this record to the buyer who insists on the best in *product* and *service*.

Construction Machinery Company

General Office and Factory, WATERLOO, IOWA

Western Office: LOS ANGELES, CALIF. 455 East 3rd St.

Central Office: INDIANAPOLIS, IND. 315 W. Maryland St.

Eastern Office: PHILADELPHIA, PA. Widener Bldg.

A Composite Pile of Concrete and Wood

Tests of New Pile for Permanency and Load-Bearing Ability

IT is common knowledge that a wood pile shows its first evidence of deterioration at the top. This naturally suggests the permanency of a wood pile unit having a concrete top extending down to an elevation well below permanent water-level. The Raymond Concrete Pile Company, 140 Cedar Street, New York City, has developed a composite pile which makes use of this combination. Where long piles are required and permanent water-level is within a reasonable distance below the surface, it is usually cheaper to substitute wood for concrete in that portion of the pile which is permanently submerged. The idea is not a new one, but the development of a joint of sufficient strength and rigidity, together with a method that will insure uniform and satisfactory results, has required considerable thought and ingenuity and a long series of experiments.

To insure a satisfactory composite pile, it is necessary to provide a means of driving a pile and a superimposed concrete section so that a perfect alignment may be maintained between the two sections. It is necessary to accomplish this driving in a manner that will preserve the head of the wood pile from injury during the driving, as any distortion or destruction of the head would, of necessity, weaken the joint of which it forms a part, or allow settlement between the concrete and wood sections. A tight joint must be provided which will exclude water, mud, running sand or other foreign substances. Reinforcement and anchorage must be provided to lock the concrete section to the wood section so that the two units cannot separate or be displaced by the action of ground heave. A joint must be provided to unite the two materials, so that the transverse strength at any section will approximate that of the wood pile. All the operations must be carried on in a manner that will permit of the inspection and checking of each step.

Placing Composite Piles

The steps involved in placing composite piles consist, first, in driving the wood pile to ground level. Before being driven, the wood pile is provided with a tenon approximately 9½ inches in diameter and 18 inches long. By means of a special machine this tenon is accurately shaped and cut square at the end so that a perfect contact is provided between the follower and the pile, thereby avoiding any brooming or damage to the tenon during the period of driving. This tenon likewise fits closely the cylindrical opening at the end of the Raymond core, and thereby insures a true alignment between the wood and the concrete section. A hollow boot closely encases the bottom of the steel shell on the core and at the same time fits tightly over the tenon of the wood pile. These joints exclude all foreign matter, providing a form which is susceptible of inspection after the pile is driven and before the concrete is placed therein. The spiral reinforcing of the shell adds to the strength of cylinder of concrete which surrounds the top part of the wood pile.

A SPECIAL MACHINE SHAPES THE TENON AND CUTS THE END SQUARE

Before the wood pile is placed in the leads, a steel socket is imbedded in the center of the tenon and secured by a ⅞-inch steel pin extending transversely through the tenon and socket. This socket has a heavy internal thread which receives the threaded end of the deformed bar. The bar is screwed into the socket after the wood pile has been followed down to its final position and the core or follower has been collapsed and removed. It thus provides a reinforcement to the concrete, and also acts as a rigid lock between the wood and the concrete.

The concrete section of the pile is made by using a Raymond composite core which is encased in a spirally reinforced steel shell. This core acts as a follower in carrying the wood pile down to the desired elevation. The core is then collapsed and withdrawn, leaving the shell in the ground, to be filled with the concrete. When this has been done, a well-built concrete pile is securely locked to the top of the wood pile.

Here's Your Copy!

Send in the Coupon Today

THE new Heil twenty-eight page CATALOG 140 will make it easier for you to pick out Dump Bodies and Hoists you want for your motor trucks. Batch Bodies, Combination Bodies, Asphalt Bodies, and all other standard Heil Steel Dump Bodies are shown with large pictures and actual blue print diagrams. Eight pages describe Heil Hydro Hoists, Mechanical Hoists, Vertical Hand Hoists, and Underneath Hand Hoists. You'll want to have this Catalog 140 handy for selecting your 1925 equipment. Just fill out the coupon and send it in. No obligation on your part whatever.

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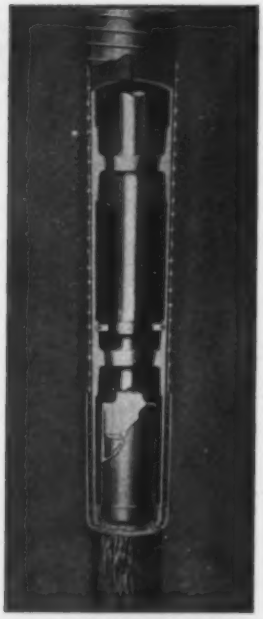


THE COMPOSITE CORE WHICH IS USED IN DRIVING THE WOODEN PILE AND THE SPIRALLY REINFORCED STEEL SHELL

Thorough Tests for Chicago Building Department

In April, 1922, the Building Department of the city of Chicago conducted a test of Raymond composite piles. The wood pile was 43 feet and the concrete section 12 feet in length. The wood pile was driven to ground level with 90 blows of a No. 1 Vulcan type steam hammer having a moving part weighing 5,000 pounds and falling a distance of 3 feet at the rate of 60 blows per minute. The Raymond composite core was then placed on top of the wood pile as a follower, and 565 blows of the No. 1 hammer were required to drive the pile the additional 12 feet to hard-pan. A test load of 103,000 pounds caused a total settlement of 29/64-inch, which is well within the allowable settlement for a safe load of 25 tons under the Chicago City Building Code.

After the load had been removed, the pile was excavated to a point about 18 inches below the joint, and the wood pile was sawed off at this level. The concrete pile was then also cut off about 4 feet higher up, and the joint section thus obtained was raised to the surface of the ground for further examination. A portion of the concrete was cut away to expose the wood tenon, the top of which, notwithstanding the 655 blows of the No. 1 hammer, was in perfect condition and showed no evidence of splintering or brooming. The pile tested was one of three placed at points of a triangle on 3-foot centers. It was the first one driven and concreted. The shell of the second pile of the group was left open; that is, not filled with concrete, while the third pile was driven, and these two empty shells were allowed to remain open for an hour or more, after which a thorough examination failed to disclose any seepage of mud, water or any other foreign element into the interior. The wood pile used in the test was an average cypress pile and was not specially selected for straightness or quality.

In many soil conditions Raymond composite piles can be loaded in excess of the maximum load allowed on wood piles, for the reason that the large surface area and the taper of the concrete section relieve the underlying wood member of much of its load.

Precise Leveling in New England

Valuable Paper in *Journal* of Boston Society of Civil Engineers

THE recent completion by the United States Coast and Geodetic Survey of a line of precise levels from Providence, R. I., to Portland, Maine, has resulted in the establishment of permanent bench-marks along this route which are rigidly adjusted into the base net of the United States. The Boston Society of Civil Engineers has assisted the Coast and Geodetic Survey in the coordination of this work in order that the resulting information might be of the greatest value to municipal and state departments, public utilities and private engineers. Although some of the data will ultimately be printed in government publications, an account of the work, together with the descriptions and elevations of the permanent bench-marks, has been printed in the September, 1924, issue of the *Journal* of the Boston Society of Civil Engineers.

The Precise-Level Net of the United States

In the early history of the United States Coast and Geodetic Survey it became expedient to connect the coastal surveys on the east and west coasts in order to reduce all surveys in this country to a common datum. Accordingly, the "Transcontinental Arc" of precise triangulation was established. To strengthen the connection and to extend the area covered by precisely located points, which were found very useful by local engineers, the execution of other arcs was begun. In order to have information for applying sea-level reductions, essential in adjusting the work, the Coast and Geodetic Survey started running lines of accurate levels. It was found that elevations thus obtained were useful to topographers using the triangulation point mentioned as well as to other surveyors and engineers of the vicinity. The value of this work was so great that a careful study of leveling was undertaken in order that long distances might be covered without large accumulations of errors. The methods of working have been gradually improved and standardized, and at the same time large additions have been made to the level net.

Over 48,000 miles of precise leveling have now been run in the United States. Of this amount

QUICK LOADING MIXING DISCHARGING

THE "STANDARD" 4-S MIXER

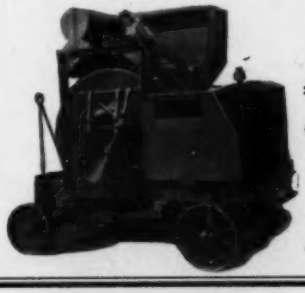
McCoy & Westenhaver, of Benwood, W. Va., working in Wheeling, figured it would take them 2 days to mix and pour 32 yds. of concrete for a retaining wall.

It took just 7 hours!

Figure for yourself the saving with an average wage of 60 cents an hour.

Send for further information and catalog

ACTIVE DEALERS WANTED IN TERRITORY NOT YET ASSIGNED.



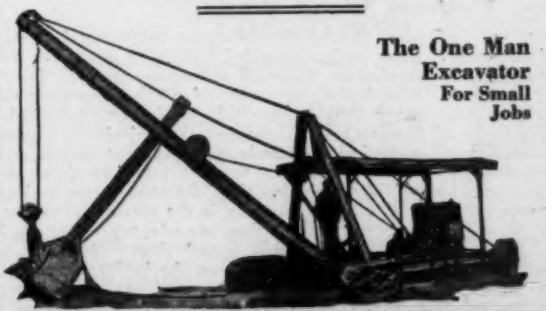
The Standard Scale & Supply Corp.

1631 Liberty Avenue, Pittsburgh, Pa.

New York	Philadelphia	Chicago	Cleveland
45 Chambers St.	523 Arch St.	163 N. May St.	721 St. Clair Ave., N. E.

Model 16-B—With Skimmer—Also operates Trench Scoop, Clamshell and Crane Attachments

The One Man Excavator For Small Jobs



A low priced caterpillar excavator for small jobs. Operates Shovel — Clamshell — Dragline.

LOWER YOUR EXCAVATING COSTS with BAY CITY EQUIPMENT

The Bay City 16-B Convertlbie Crane Excavator and the One Man Excavator have made many friends by their ability to handle work at lower cost.

The Bay City Skimmer has no equal for shallow road or pavement cutting and its sturdy all steel construction insures continuous work.

It will pay you to investigate the Bay City and the reasons for Bay City repeat orders.

Land Dredges — Cranes — Excavators

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BAY CITY, MICH.

Eastern Office:
302 Broadway, New York

the Coast and Geodetic Survey has done about 32,000 miles, the remainder having been done by the United States Geological Survey, the Corps of Engineers, the United States Army, the Mississippi River Commission, the Missouri River Commission, the United States Lake Survey, the Pennsylvania Railroad, the Baltimore & Ohio Railroad, and the Buffalo, Rochester & Pittsburgh Railway. This vast network of leveling enters all the states of the Union but one and forms over one hundred closed circuits. It is desired ultimately to have the net cover the country in such a way that every point in the United States will be within 50 miles of a standard bench-mark.

During the season 1922-23 about 850 miles of precise leveling were completed in New England by the United States Coast and Geodetic Survey, some 500 miles of which were executed by Elliott B. Roberts, Junior Hydrographic and Geodetic Engineer of the U. S. C. & G. S., author of the excellent paper referred to above. This leveling connects with previously determined points in the base net of the United States at three places—Yonkers, N. Y., Poughkeepsie, N. Y., and Rouses Point, N. Y.—and is rigidly adjusted to the base net. This work has been done in conformity with the Coast and Geodetic Survey instructions for precise leveling, and its accuracy is of the highest order obtainable under the present knowledge of the subject of precise leveling.

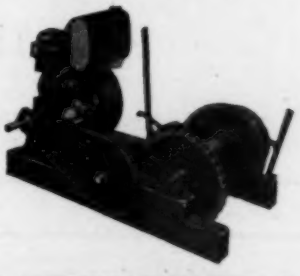
A Light-Weight Reversible Hoist with Gasoline Power

Outfit Capable of Handling Many General Contracting Jobs

A REVERSIBLE hoist which has been popular with general contractors has been placed on the market by the Universal Hoist and Manufacturing Company, Cedar Falls, Iowa. This Ideal hoist is equipped with a large cable sheave wheel on the drum-shaft for operating double-cage elevators and is readily adapted for hoisting with a single line from the drum. It is powered with a 5-horse-power New-Way air-cooled engine and has two internal expanding friction clutches lined with special compressed asbestos lining. The drum can be operated in either direction with gears on the one side and the sprocket chain on the other. It is regularly furnished with an asbestos-lined friction foot-brake, as well as a safety lock for holding the load.

The hoist can handle 1,000 pounds with a rope speed of 100 to 130 feet per minute. It is light-weight, the hoist and engine complete weighing only 750 pounds, so that when mounted on skids it can easily be moved from place to place. It measures 4 feet 8 inches long by 3 feet wide over-all and will pass through a 3-foot door or opening.

The engine power can be varied from 2 to 5 horse-power and is controlled by an automatic



A REVERSIBLE HOIST WITH DEPENDABLE POWER

throttling governor. The engine is dust-proof, all the wearing parts being enclosed and running in a bath of oil. The absence of radiator, water-jacket, pump and water connection permits the utmost simplicity of design and construction in the engine, with complete, instant accessibility to all parts. This engine runs on kerosene, gasoline or natural gas.

When Good Methods Won't Work

NO better example of the interdependence of industry and the impossibility of injecting speed and efficiency into a community hampered by leisurely customs can be put forward than the one given by Robert D. Kohn, New York architect, who lately returned from England. Mr. Kohn found the contractor on a London building using a breast derrick operated by six men to hoist steel from the street. He estimated that it required several hours to unload a truck of structural steel, one member at a time. Traffic was blocked while this work was carried on.

In discussing the matter with the Mayor of the borough, Mr. Kohn pointed out that in America an application would be filed for electric power a couple of days before operations started, and that the power company would have the meters and the connections installed so that the power hoists could handle all deliveries effectively. The Mayor replied that as the contractor might not be a ratepayer in the borough in which his work was being carried on, he could not secure power. The objection that the owner of the building as a ratepayer could secure this service was admitted as bearing on the case, but the Britisher's argument was clinched when he explained that an application for service usually was not passed on for a year.

Under such conditions, the most forward-looking and skillful contractor in the country would be in no better position than one who was using the job methods of King James' time. Technical advances are nullified when the business concept of "service first" is unknown or unapplied throughout the community. The vast body of practical information developed through the laborious method of trial and error cannot but be valueless when industrial cooperation is lacking.

—*The American Contractor.*

One Miami Scraper and Fordson Tractor Saved $1168.66 in 83 Working Days

The Clear Creek Quarries Co., of Bloomington, Indiana, moved 4133 cubic yards of settled dirt in 83 working days. This was accomplished with one Fordson Tractor. The average length of haul was 350 feet one way or 700 feet round trip.

The total expenses were as follows:

Tractor Driver and plowman....	$502.68
Fuel	222.41
Repairs	84.55
Depreciation	88.00
	$897.64

The total number of yards moved was 4,133 at a cost of only .217 cents per yard on a 350 foot haul.

The best contract price quoted the Clear Creek Quarries Co. was 50c per yard or $2,066.50 for the job. This left them a net profit of $1,168.66 for the 83 working days.

This resulted in paying for the complete Scraper-Tractor unit in 68 working days.

You can do the same on your dirt moving job. Don't fail to see this machine in operation at the Chicago Road Show. Write today for complete cost data and literature.

The Miami Trailer Scraper Co. 610 S. Clay St., Troy, Ohio

MIAMI FORDSON one man power **SCRAPER**

The Huber Motor Roller

THE Huber Four-Cylinder Motor Road Roller combines a modern internal combustion engine with modern power transmission. It starts easy and keeps going. It has a low center of gravity, surplus power, convenient control, and economy of operation. The air controlled scarifier folds up neatly underneath the deck when not in use.

Because of its lack of vibration and ability to back and go forward quickly, without jerking or shifting of gears, a well known Chicago contractor has found the Huber motor roller very effective in rolling hot asphalt on Chicago streets. The results are greatly superior to those secured by tandem roller as the compression is more uniform—there is no bridging over—consequently no soft spots left in the base.

The Huber Manufacturing Company
106 Center Street, Marion, Ohio, U. S. A.

See the Huber at the Road Show! Greer Building, Space G-15

HUBER ROAD TOOLS
MAINTAINERS - ROLLERS

A One-Man Motor-driven Grader

New Outfit Being Displayed at Road Show

AN exhibit of a one-man motor-driven road grader which has recently been put on the market by the Austin-Western Road Machinery Company, 400 North Michigan Boulevard, Chicago, is being held at the Road Show in Chicago. One of the distinctive features of this machine is the position of the operator. All of the controls for the operation and steering are centered at an operator's station far enough behind the blade so that the front portion of the blade, the surface of the road immediately in front of it on which the blade is scraping or grading, and a substantial zone of the road through which the machine is being propelled, are all in practical alignment and all within the operator's vision without moving his head.

This makes the operator able to distinguish the high spots from the low spots, and in sufficient time to be able to make the required change in the blade to meet what is coming. From his station the operator also has his eye on the front portion or cutting end of the blade, which he must observe to do his work properly, and the blade is in alignment with the surface of the road some distance ahead.

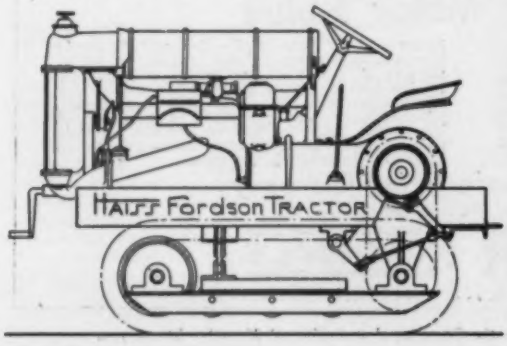
A ONE-MAN GRADER WITH FORDSON DRIVE

These new one-man graders are furnished with 6-, 8- or 10-foot blades. The latter size is desirable for removing snow or for light maintenance work. Additional features which are supplied for these graders are the rubber-tired wheels and scarifying attachment. The latter is hung in front of the blade and can be lowered to the working position when needed.

A New Fordson Tractor Traction-Tread Unit

Increased Capacity over Uneven Ground Made Possible with New Tread

THE new crawler tread unit for Fordson tractors which has been brought out by the George Haiss Manufacturing Company, Inc., 142nd Street and Park Avenue, New York City, is installed by dismounting the four tractor wheels and installing a set of crawler tractor links, which gives the machine better ability to go over uneven ground and to pull greater loads.



CRAWLER EQUIPMENT FOR THE FORDSON

The general dimensions of the outfit are 8 feet long over-all, 6 feet over-all, and 4 feet 10 inches high. The length of the track ground is 4 feet 6 inches, the ground clearance is 12 inches, and the tread of the track is 5 feet 10 inches long. When equipped with the Haiss-Fordson links the machine can make 0.8-mile per hour in first, 1.47 miles per hour in second, 3.63 miles per hour in third, and 1.41 miles per hour in reverse. The machine has a drawbar pull of 15 horse-power, and is steered by brakes adjacent to the sprocket of the jack-shaft and differential, which is enclosed. This action slows down or stops either creeper and permits the alternate track to carry the machine around.

The track is of exclusive Haiss design. Each track contains 31 special electric steel shoes, annealed to give them long life. The track links have a heavy double rail cast integral with the track shoes.

The
Henry H. Meyer Company

QUALITY SERVICE

PARTIAL LIST OF MANUFACTURERS REPRESENTED

Austin Western Road Machinery Co., Road Rollers, Graders, etc. Blaw-Knox Co., Steel Bins, Batchers, Clam Shell Buckets, Road and Sidewalk Forms. Boston & Lockport Block Co., Wire and Manila Rope, Blocks and Sheaves, etc. C. H. & E. Manufacturing Co., Saw Rigs, Pumps, Hoists, etc. Chain Belt Company, Rex Building and Paving Mixers. Connery & Company, Portable Tar and Asphalt Kettles. Connecut Shovel Co., Shovels. E. I. du Pont de Nemours & Co., Inc., High Explosives. Edwin Harrington, Son & Co., Inc., Chain Hoists. Insley Manufacturing Co., Concrete Towers, Chutes, Buckets, Steel Derricks, etc. A. Leschen & Sons Rope Co., Wire Ropes. Lidgerwood Manufacturing Co., Steam and Electric Hoists, Cableways, etc. Novo Engine Co., Gasoline Engines, Hoists, Pumps, Compressors, etc. H. K. Porter Co., Industrial Locomotives. Pulsometer Steam Pump Co., Steam Pumps. Sterling Wheelbarrow Co., Wheelbarrows, Concrete Carts, etc. Templeton-Kenly Co., Simplex Jacks. Universal Crane Co., Portable Cranes. Universal Road Machinery Co., Stone Crushers and Sand and Gravel Plants.

BALTIMORE MARYLAND

Write for Special Folder, giving specifications, weights, and optional equipment. Do it Now.

KWIK-MIX
CONCRETE MIXER

SPEED! CAPACITY! POWER!
~you get them *all* in the KWIK MIX

CONTRACTORS, large and small, prefer the Kwik-Mix. And rightly so, because it has speed—capacity—power and other advantages that make it a quick-acting, economical tilting mixer. There is a Kwik-Mix Mixer for practically every concrete job—a size that is light on cost and heavy on profit.

Extra large drum—low charging height—quick mixing—single lever skip control—automatic clutch locking device—light weight—positive drum stop lever—ample power—generous ½-bag capacity—durable construction that gives one in-and-out dependable service.

Kwik-Mix Mixers range in sizes from 2 to 5 cu. ft. of mixed materials.

KWIK-MIX CONCRETE MIXER CO.
Port Washington Wisconsin

A Portable Oil-Burning Asphalt and Pitch Heater

Adaptable to Street and Highway Work

A NEW asphalt and pitch heater making use of an oil flame for melting and heating the material has been brought out by the Mohawk Asphalt Heater Company, Scotia, N. Y. The cold lump material is placed on a sloping shelf above the tube through which the burner flame is projected. The melted material flows down into the supply tank as soon as melted and is maintained at high temperature by the flue gases which pass under the sloping oven, then downward under the supply tank and up to the exhaust. The partion which separates the cold material and the hot is removable for cleaning or renewing. A draw-off valve at the bottom of the tank makes it possible to quickly draw off the hot material for use.

A PORTABLE HEATER

The 50-gallon "Hotstuf" heater has an approximate melting capacity of 5,600 pounds of asphalt in 8 hours, or 7,000 pounds of coal tar pitch in the same time. The fuel consumption is approximately one gallon of kerosene per hour, and the storage capacity of the heater is one barrel of cold material. This heater when mounted on legs is 26 inches wide and 36 inches long. Mounted on wheels it is 36 inches wide and 72 inches long. The approximate shipping weight on legs is 350 pounds complete, and on wheels 500 pounds complete. The 100-gallon heater, which has a melting capacity of 8,000 pounds of asphalt in 8 hours, and 10,000 pounds of coal tar pitch, consumes 1½ gallons of kerosene per hour and has a storage capacity of 2 barrels of cold material. This heater, which is only mounted on wheels, has a heater width of 36 inches, a length of 50 inches, an over-all width of 51 inches, and an over-all length of 89 inches. The approximate shipping weight is 750 pounds complete.

This heater is particularly adaptable to street and highway work, and because of the special elevated melting chamber the hot material is produced immediately at proper working temperature, saving several hours of waiting.

Extensive Testing Ground for Motor Trucks

A GMC 2½-ton truck is to be kept constantly at work maintaining the 6 miles of gravel testing road on the new General Motors proving ground, according to a recent announcement of the General Motors Truck Company, Pontiac, Mich. This new proving ground, which is centrally located between Lansing, Pontiac, Detroit and Flint, where the main automobile and truck factories of General Motors are situated, contains 1,125 acres of land and more than 8 miles of gravel and concrete highways which are used for proving General Motors machines under actual operating condition.

The 2½-ton GMC truck which has been put in operation on the gravel road is equipped with a scraper and other road machinery for work during the summer and will operate a snow-plow to keep the testing grounds clear throughout the winter, thus making testing possible at all seasons.

A SECTION OF THE TEST GROUNDS OF THE GENERAL MOTORS TRUCK COMPANY, SHOWING GRAVEL ROAD AT RIGHT

Hunter Machinery Company

Milwaukee, Wisconsin

Wisconsin's oldest and largest contractor's equipment firm

Warehouse, Shop, and Offices on the 16th Street Viaduct.
Large Stock for Prompt Shipments.

Blaw-Knox—Buckets, Bins, Road Rail.
C. L. Best—Tractors. (Tracklayer type)
Chain Belt Company—Concrete Mixers, Pavers.
Clyde—Hoisting Engines, Derricks.
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Northwest—Cranes and Shovels.
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LeRoi—Gasoline Engines.
Western—Wheeled Scrapers, Road Machinery, Cars and Track.
Milwaukee Locomotive—Locomotives.
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The Parsons Co.—Trenching Machines, Backfillers.
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Chicago, Ill.

We carry in Stock

Oshkosh Concrete Mixers and Saw Rigs
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Insley Steel Towers and Chutes
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Wyoming "Red Edge" Shovels
Erie Peerless Clam Shell Buckets
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Contractors Equipment and Supplies.

Member of Associated Equipment Distributors

Lower Paving Costs for 1925 by Curing Pavements *with* Dowflake

See Our Exhibit at the **ROAD SHOW**

MUNICIPALITIES and paving contractors can save a lot of money and simplify concrete curing by keeping Dowflake on hand all the time.

There is no further need to carry the burdens of the old-fashioned curing methods. Contractors who use Dowflake cannot say enough about the relief to them that comes from having for the first time a really scientific curing method.

The sole requirement for the best cure is moisture to complete the action within the cement.

Dowflake which one man applies to the day's mixer run in an hour supplies the necessary moisture which was previously secured by laborious, tedious and costly methods with miles of pipe lines and hose, tons of earth and many full time laborers.

Dowflake maintains the moisture long enough to complete the cure where previously regular moistening was necessary even with plenty of earth and straw covering.

Dowflake does not dry out so needs no inspector to insist on maintenance of moisture.

But the remarkable properties which have caused the adoption of Dowflake as the standard cure in states doing the greater part of paving are not the only reasons why a supply of Dowflake becomes so essential.

It speeds up curing and, therefore, is extremely valuable late in the season.

It simplifies and hurries up the patching jobs.

Read the New Book "How to Cure Concrete"—Write for a copy now if you haven't received one yet.

KEEP ROADS UP AND TAXES DOWN WITH

DOWFLAKE

CALCIUM CHLORIDE

DOW

Save Gravel Road Surfaces With Dowflake Maintenance

EVERY year thousands of miles more of gravel and stone road have been put under Dowflake maintenance.

Hundreds of thousands of dollars in resurfacing costs have been saved.

Dowflake with its continuous moisture bond saves the surface. As long as the surface stays the road can't go to pieces—the metal cannot seriously pit and break through.

And with more thousands of miles of Dowflake road many more thousands of motorists and roadside dwellers are going to their highway officials and are writing us, saying—"the dust prevention alone is worth more than Dowflake maintenance costs."

Since Dowflake first became known as the long sought preserver of gravel and stone roads, it has been approved and adopted by one state after another until it is used from coast to coast.

Already, as this is written before 1925 begins, more highway divisions have arranged for supplies of Dowflake than ever before.

Satisfaction is uniform, for Dowflake does save the road, it saves money, and it thoroughly conquers the dust nuisance.

Write for the new and revised edition of "How to Maintain Roads." It's a manual—not an advertisement, yet is mailed without cost to those really interested in maintenance. Ask for your copy.

***See Our Exhibit at the* ROAD SHOW**

THE DOW CHEMICAL COMPANY

143 Water Street

Midland, Michigan

Branch Sales Offices
90 West Street,
New York City
Second and Madison Sts.,
Saint Louis

KEEP ROADS UP AND TAXES DOWN WITH
DOWFLAKE
CALCIUM CHLORIDE

Old Brick Street

Kyrock Converts Old Brick

Fourth street, an old brick pavement at Lafayette, Ind., had been in service for thirty years and, although the foundation was solid, the surface was very rough. Bricks in some instances were worn to one-quarter inch thickness.

Before surfacing with Kyrock, the old pavement was cleaned with a fire hose, the pressure being sufficient to clean out the interstices between the bricks. Deep depressions caused by excavations for water connections were filled with concrete to the level of the old pavement. The entire surface was then lightly painted with asphalt cement.

The Kyrock surface was laid cold and without any mixing or other preparation. The asphalt was dumped on the street in advance of the work, shoveled into place and spread, raked and rolled. The street was immediately opened to traffic. About four working days were required for surfacing the entire seven blocks. The only equipment required was trucks, shovels, rakes and roller.

After Surfacing with Kyrock

Into a Durable Pavement

The finished pavement is smooth, noiseless, dustless and resilient. In appearance, it is the same as the finest sheet asphalt. Unlike the mixed asphalt pavements, however, the Kyrock surface does not shove, buckle, roll or bleed. And the cost of converting this old brick street into a first-class pavement was considerably less than one-half the cost of a new construction.

Kyrock is solving a big problem in scores of cities which have old brick asphalt, macadam and gravel roadways which are solid but rough. It is shipped ready to lay cold without special equipment or expert labor. Kyrock offers a means of having the highest type streets at a great saving. Write for booklet CEM.

Kentucky Rock Asphalt Company
Incorporated
Marion E. Taylor Building **Louisville, Kentucky**

Mack Truck Chassis Model A C

Mack Truck Chassis Model A B

Mack City Bus

REG. U.S. Mack PAT. OFF.

for profitable Transport service

Mack Sedan Bus

Mack Fire Apparatus

Mack Rail Car

MACK TRUCKS, INC.

INTERNATIONAL MOTOR COMPANY

25 Broadway New York City

Eighty-three direct MACK factory branches operate under the titles of: "MACK MOTOR TRUCK COMPANY" and "MACK-INTERNATIONAL MOTOR TRUCK CORPORATION."

PERFORMANCE COUNTS

Spearwell Mogul Loader

A Strictly *One-Man* Outfit

Full length all steel creeper tread track giving over 1500 sq. inches of bearing surface. Suitable for all soil conditions.
Two digging speeds, 20 and 4ft. per minute. Two traveling speeds ½ to 2½ miles per hour.
Heavy manganese steel ribbon screw feeding device 8 ft. long mounted on 3-3-16 in. steel shaft.

Digging position quickly and easily adjusted and in new models absolutely controlled by special grading shoe.
Also equipped with swivel chute.
Write for literature and prices on Spearwell Loaders.

A Size for Every Need.

Spears-Wells Machinery Co., *Inc.*

Ninth and Cedar Streets Oakland, Calif.

SUPERIOR AUTOMATIC DUMP BODY

Automatically dump when loaded. Stiff leg holds body in dumping position until released by driver.

Body of one piece sheet steel with rounded self-cleaning corners. No chains to rattle. 1½ yard capacity. Built for Ford, Indiana, International, Graham and Service Trucks.

Manufactured by

SUPERIOR BOILER WORKS

Patent applied for MARION, IND.

This Valuable Booklet Free

IT is small in size, but packed with useful ideas on how to save money in digging and moving earth and other loose materials. It may help you to solve some difficult problem. Write for it today.

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Crossing the Delaware!

Are you familiar with the latest engineering method as you are with that of our country's first engineer?

Delaware River Bridge Model "Sterling" Engineer's Wye Level

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WE REPAIR AND ADJUST ALL MAKES OF TRANSITS, LEVELS, TAPES, ETC.

Rebuilt Instruments of various makes in Guaranteed Condition for Sale or Rent

Packard TILTER FORD TRAILER MIXER

MOST REASONABLY PRICED MIXER IN AMERICA

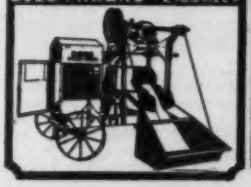
BUILT IN ALL SIZES AND TYPES

Get New Prices—Terms. Just off Press.

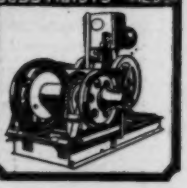
The American Cement Machine Co., Inc.

Branch Offices Everywhere — Keokuk Iowa — Branch Offices in All Principal Cities

BOSS MIXERS 1/2 to 5 S.A.E. SIZE



BOSS HOISTS - $125



PREFERRED

All road building equipment is being chosen upon its known service records. Silver-tongued salesmanship does not apply here. The service records of Monarch Industrial Tractors have made them the preferred tractors among discriminating road contractors.

MONARCH TRACTORS, INC.

Watertown, Wis., U. S. A.

Builders of

The Crawler without Track Trouble.

Monarch INDUSTRIAL TRACTORS

THE MOST DEPENDABLE CRAWLER

STEAM KEYSTONE SHOVELS

MODEL 4.—14 ton All Steel Excavator with ⅝ yd. Skimmer

The KEYSTONE is a highly versatile traction steam shovel with all the efficiency of specialized design, usable with three different interchangeable scoops—*Skimmer, Ditcher and Clam Shell*—for Road Grading, Trenching, Back-Filling, Cellar Digging, Pit Mining, Loading, Unloading and Handling Materials. Can be equipped with electric motor drive for use in buildings. Saves first cost, moving cost and upkeep and is *readily sold or rented* for any sort of excavation job. A reliable road shovel of remarkable adaptability to other uses.

DITCHER

Keystone stands on the solid. No cribbing needed, no danger from cave-in, of machine sliding into excavation. Any width or depth to 20 feet. There is 4 feet of water in this 12 foot ditch. The Keystone is adapted for hard going among roots, boulders, etc., and cleaning out blasted rock.

Keystone Driller Company, Beaver Falls, Pa.

BARTON PORTABLE PUMPER
with the automatic primer using the power your motor car affords
Is the most practical pumping equipment on the market. Used and approved by contractors, Engineers and public works Depts. Write for Bulletin No. 56.
AMERICAN STEAM PUMP CO.
BATTLE CREEK, MICHIGAN

Compare This Work

One has only to compare the work done by a gang of laborers with the work done by the
BURCH SPREADER
to see the great advantages of putting your road material on the bed by this machine. In time, labor costs, thoroughness, evenness and economy of material, the machine wins. It pays for itself in a mile of highway. With the
BURCH UNLOADER
material is taken from the cars and spread with quickness, thoroughness and economy that appeal to every contractor.
Let us tell you the results in dollars as well as time.
The Burch Plow Works
Dept. B2 **CRESTLINE, O.**

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TRADE MARK REGISTERED U. S. PATENT OFFICE

Man, if you ever wanted a good, sure, safe car—this is it.
No car made can surpass this Heavy Duty, Square Box Dump Car—it's in a class by itself.
Let us send our bulletins to you.
Koppel Industrial Car & Equipment Company
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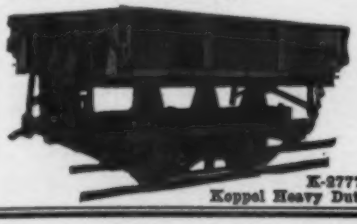
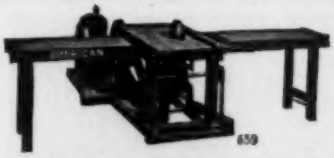


K-2777
Koppel Heavy Duty Car



AMERICAN

Saw Rigs of every description. Hoists, Woodworking Machinery. A line you can sell.
American Saw Mill Mchy. Co.
171 Main St., Hackettstown, N. J.

HOISTING BLOCKS
STAR BRAND
Are Always Reliable
Made For
Every Condition of Service
Sold By
Leading Supply Houses
or
BOSTON & LOCKPORT BLOCK CO.
NEW YORK **EAST BOSTON** **CHICAGO**

ASPHALT PLANTS

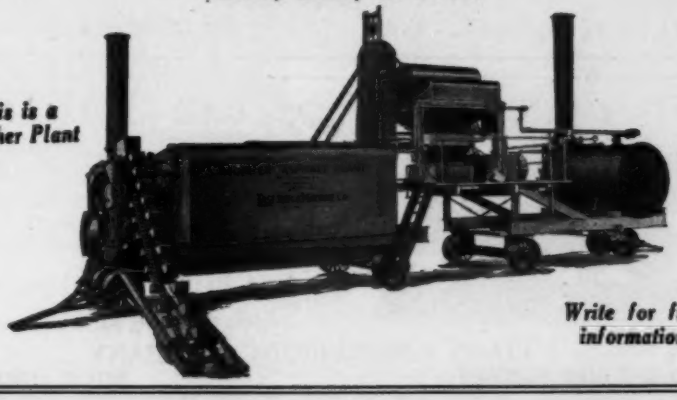
The Mosher
Steam melting Two-Unit Portable Road plant. Capacity 1800 yards.

The Merriman
One car steam melting plant. Guaranteed capacity 2250 yards.

THE EAST IRON & MACHINE CO.

Lima, Ohio, U. S. A.

This is a Mosher Plant



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On Exhibit
EVERYWHERE—

On the roads and streets of municipalities everywhere,—on state and county highways throughout the nation,—you will find LITTLEFORD Road Maintenance and Construction Equipment, holding a continuous Road Show of its own —demonstrating in actual daily use, the distinctive qualities that make LITTLEFORD Equipment *preferred* above all others.

Manufacturers of

- Tar and Asphalt Heaters (all sizes).
- Fire Wagons.
- Sand and Gravel Driers.
- Asphalt Paving Tools.
- Asphalt Pouring Pots.

Catalogue on request.

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500 East Pearl Street, Cincinnati, Ohio

ROAD GRADER BLADES

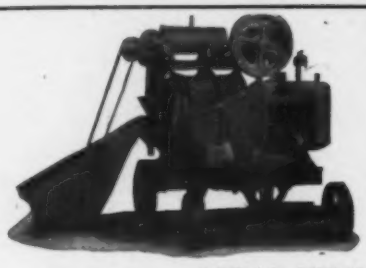
OF SUPERIOR QUALITY

FOR ALL MAKES OF ROAD GRADERS AND DRAGS

We also manufacture Moldboards, Steel Frames, Scarifier Teeth, Etc., for Road Graders to specifications.

WE CARRY 5,000 FINISHED BLADES IN STOCK AND CAN MAKE PROMPT SHIPMENT

SHUNK MFG. CO., - BUCYRUS, OHIO



Atlas YARDAGE

120 to 150 Cu. Yds. in 10 hours with an Atlas one bag Mixer.

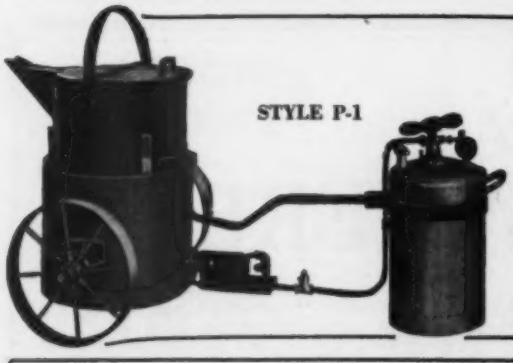
Atlas Mixers are of sturdy dependable construction, and the 7-S is regularly equipped with multiple cylinder LeRoi Engine, giving excess power.

We build 3½ ft., ½ bag, 1 bag and 2 bag Mixers.

Dealers write for agency proposition.

ATLAS ENGINEERING COMPANY

3036 GALENA STREET, MILWAUKEE, WIS.



STYLE P-1

CONNERY'S
Tar and Asphalt Heaters

Non-Leakable Welded—"Held by the Weld."
20 Styles.

10 to 1000 Gallons Capacity Carried in Stock.

Style P-1 Oil Burning Patrol Patching Heater is used for heating small quantities of tar, pitch, asphalt or bituminous filler as used in connection with asphalt brick and granite stone or wood-block paving. This outfit heats twice as fast as one with a wood fire, and is particularly useful in city streets as it burns without smoke and leaves no hot ashes on the pavement.

Send your name for illustrated catalog of all sizes and styles

CONNERY & CO., INC.
4000 N. SECOND ST., PHILA., PA

Pennsylvania Cement

:-: **QUALITY** :-: **SERVICE** :-:

PENNSYLVANIA CEMENT CO.

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MAKE BETTER ASPHALT STREET REPAIRS

EQUITABLE SURFACE HEATER

(Improved Lutz Surface Heater)

The new improved model is operated with a gasoline engine, designed for power at low speed. The change in this machine from steam to gasoline practically doubles its capacity, simplifies its operation, saves time and labor, permitting a more economical operation of the machine. It eliminates all dirt, water and steam and makes it possible to resurface without flame, from 1,500 to 2,000 square yards of pavement in an eight-hour day. It is easy to start and operate and anyone that can operate an automobile can easily run this machine.

A letter or post card will bring you full and complete information as to terms.

EQUITABLE ASPHALT MAINTENANCE COMPANY

KANSAS CITY MISSOURI

Every Water Dept. Should Have This

CHAUSSE Portable Kerosene Torches are being successfully used by water departments, contractors and railroads all over the country for thawing pipes, melting babbit, drying sand and wherever intense heat is required. Not affected by rain or wind. Can be burned in any position. Safe and economical. 3-gallon and 2-quart sizes. Don't wait for cold weather—be PREPARED. Order NOW.

Circular on Request

Chausse Oil Burner Company Elkhart, Indiana

THE ROAD BUILDERS' PUMP

This DOMESTIC High Pressure Triplex Unit

Delivers 40 to 60 gallons per minute. With a vertical elevation of 100 feet in the line, 40 gallons can be delivered through 3 miles of 2" pipe or 60 gallons per minute through 4½ miles of 2½" pipe.

We will have at the Good Roads Show, Chicago—Jan. 5-9—a complete line of Road Builders' and Contractors' Power Units.

GIVE US A CALL—at BOOTHS E 16-17.

DOMESTIC ENGINE & PUMP CO.

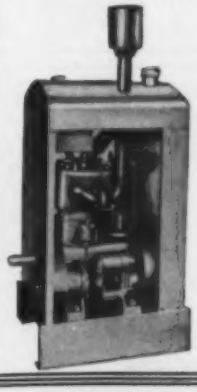
MANUFACTURERS

SHIPPENSBURG, PA.

Turmo Industrial Power Plants

Built in 4 Sizes, 8, 15, 25 and 35 H. P.

There are many advantages to MANUFACTURER and CONTRACTOR in having their ENTIRE LINE equipped with one make of engine. The "TURMO" is built to stand hard, continuous usage. Is furnished so that it can be easily applied to any Industrial equipment. Let us tell you why TURMO Power Plants are superior.



Turner & Moore Mfg. Co.

4660 Merritt Avenue

DETROIT, MICHIGAN

TURMO ENGINE
TURNER & MOORE MFG. CO

For Heating and Applying under Pressure all varieties of Bituminous Materials, Hot or Cold, for Road Construction, Maintenance of Dust Laying.

Heat and volume under instant control of operator. Positive pressure produced by the Kinney Pump.

Auto Heater and Distributor PATENT COMBINATION

Kinney

HANDY HEATER and SPRAYER

Especially adapted for Road maintenance, construction and general repair work. Contents constantly agitated while heating.

No burning or coking of materials, Pump, Piping, Hose, Nozzles, AutomaticallyHeated.

No Steam Required.

Kinney Manufacturing Company

3529 Washington Street
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Shawnee

Makes Greater Progress

In keeping with the spirit of progress in manufacturing, we have again improved the Shawnee by adding to the 1925 Model greater stability to its present enduring qualities.

1. The transmission housing is heavier and heavily ribbed.
2. The steering gear is heavier.
3. A larger steering worm with support bearing on both ends.
4. Reinforced steering yoke.
5. Heavier ball bearings.
6. Crome nickel steel worms and shaft throughout transmission.

You will be impressed with this added stability to the already satisfactory performance of the Shawnee.

Shaw Enochs Tractor Co.
2446 University Ave. S. E.
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See it at the Chicago Road Show
Jan. 5 to 9, inclusive
Booth N. C. 40
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What "AUSTIN" on a Leaning Wheel Grader Means to You

Correct design, based on an unequalled record of over 40 years of successful grader manufacturing.

The best of materials and workmanship.

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The telescopic rear axle.

Timken Roller Bearings.

Alemite High Pressure Lubrication.

And all the time-tested Austin features.

Why Take Less in a Leaning Wheel Grader?

Write today for a copy of our new Leaning Wheel Grader Catalog.

THE AUSTIN-WESTERN ROAD MACHINERY CO.

Home Office: **CHICAGO**

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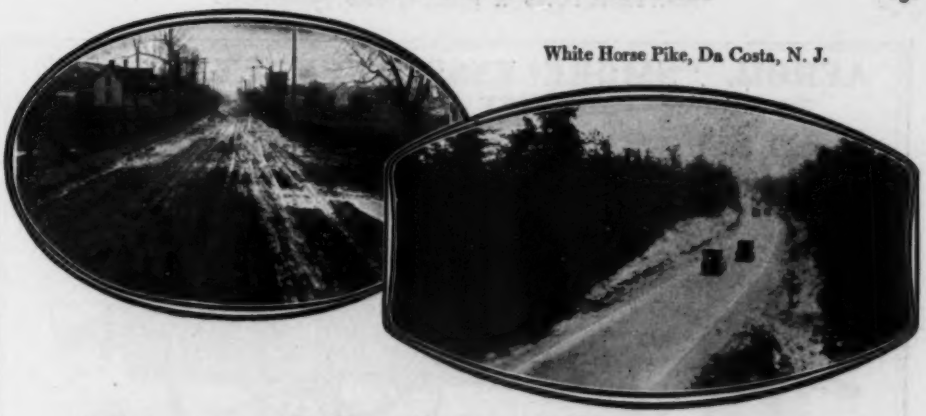


White Horse Pike, Da Costa, N. J.

From Mud to Concrete

TEN years ago the motorist who started on a cross-country trip would have wallowed through mud much of the way.

Today he reels off mileage at 30 to 40 miles an hour over perfect concrete highways. He gives small odds to fast train-schedules.

The highway engineers who made this transportation-miracle possible still remember the construction difficulties they had to meet in building the first concrete roads, chiefly the problem of controlling expansion and contraction. Proper slab design, and Carey Elastite Expansion Joint solved this problem and made the concrete highway successful.

Today Carey Elastite Expansion Joint is practically a standard specification in concrete road construction—as essential as sand and cement. Warehouse stocks maintained in every section of the country insure immediate shipment of any order right to the job without delay.

Write for engineering data and a sample.

Send for this book about expansion joint,

THE PHILIP CAREY COMPANY
9 Wayne Avenue, Lockland, Cincinnati, Ohio

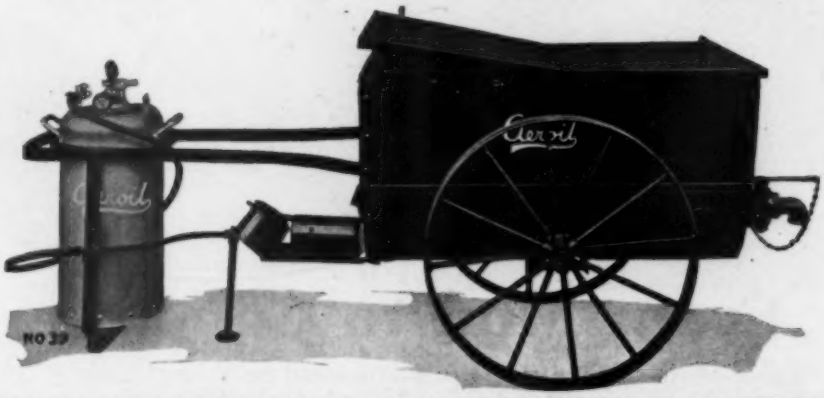
Carey Elastite

EXPANSION JOINT
PROVED AND ACCEPTED

Elastite Expansion Joint is an elastic resilient material composed of two sheets of asphalt-saturated felt between which is "sandwiched" a body of carefully refined asphaltic compound.

AEROIL "SMOKELESS" ASPHALT KETTLE

NO SPARKS — NO SMOKE — NO ASHES — JUST HEAT!



IDEAL FOR POURING CRACKS AND JOINTS IN CONCRETE PAVEMENTS

The Aeroil "Smokeless" Asphalt Kettle produces hot stuff within 10 minutes after lighting the oil burner and melts asphalt so fast that a 100 Gallon Aeroil Kettle does as much work as a 200 Gallon woodburning kettle.

USED BY THE NEW YORK STATE HIGHWAY DEPARTMENT

Let us send you a copy of our Bulletin No. 44-E.

AEROIL BURNER COMPANY, INC. UNION HILL, NEW JERSEY.

CONCRETE DRILLING

Baby Plugger for drilling holes and cutting ducts in concrete.

Concrete Busher for bushing concrete surfaces.

A full line of Hand Tools used daily in your trade.

Bulletins:
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THE DALLETT CO.
PHILADELPHIA, PA.

FOR HANDLING CRUSHED STONE or SAND and GRAVEL

From cars to trucks the RELIANCE PORTABLE CAR UNLOADER will save more than its cost in one season.

Catalog and Price List on Request.

UNIVERSAL ROAD MACHINERY CO.
KINGSTON, N. Y.
New York Office, 114 Liberty St. Boston Office, 141 Milk St.

Winning A Contractor's Confidence

14 Years

NO Maintenance

When a paving material gains this commendation for a contractor, it is little wonder it wins his confidence:

"This is to certify that in the year of 1910, the Eureka Paving Company laid an Asphalt Pavement on Lawton Street, Using Texaco Asphalt.

"This pavement carries a very heavy traffic, being on main street approach to Arkansas River Bridge, the only vehicle traffic bridge across the Arkansas River between Tulsa proper and West Tulsa.

"This pavement is in first class condition in every way today. There has been no maintenance cost to date, and from all indications apparent at this time there should be none for years to come.

"We have many miles of excellent Texaco Asphalt Pavement in the City of Tulsa, and are highly pleased with this class of pavement."

(*Signed*) CHARLES SCHULTZ,
City Engineer.

TEXACO

The Asphalt Pavement of 1,100 Cities and Towns

THE TEXAS COMPANY, U.S.A.
Asphalt Sales Department
17 Battery Place, New York City

New York, Philadelphia, Richmond, Boston, Jacksonville, New Orleans, Chicago, Cleveland, Oklahoma City, Kansas City, Houston, Dallas, Minneapolis, St. Louis

ALLERTON CLUB RESIDENCES are recognized as the home of the typical American who realizes that "Where to live" is closely linked with "How to succeed."

There are comforts, conveniences, service and recreational facilities which give the relaxation and invigoration which men of achievement demand.

Gymnasium, squash courts, roof garden, library, valet, grill, exercise rooms, are some of many advantages.

Rates $2 per day With Bath $3 per day

FRATERNITY CLUBS BUILDING

Madison Avenue—38th Street

The new seventeen story University Club residence devoted exclusively to college men. Roof Garden, Oyster Bar, Squash Court, Grille, Valet, Club Rooms, Lounges.

Rates: $11 to $25 per week
$2.50 per day upward

Supervision
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ALLERTON HOUSE COMPANY

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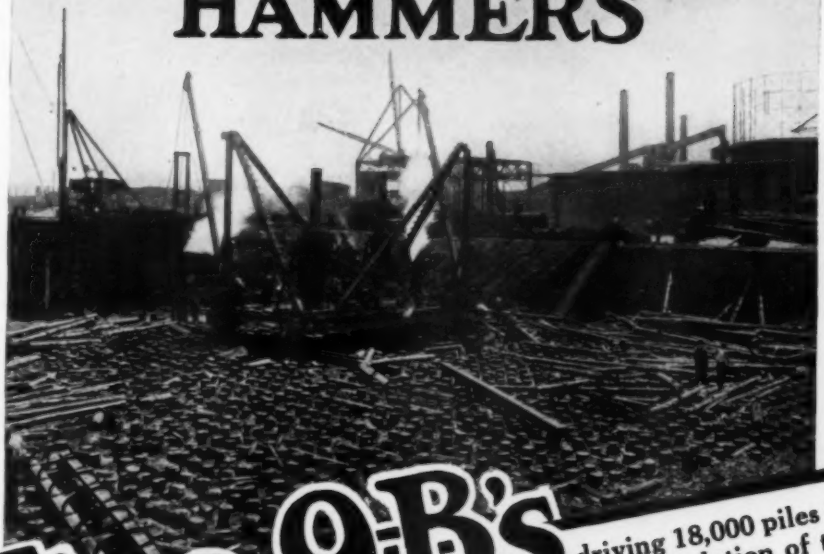
Another big job for

McKIERNAN-TERRY HAMMERS



Five 9-B's driving 18,000 piles for the foundation of the New York Edison Power Plant

The work for this $30,000,000 plant, at 14th Street and East River, New York City, is being handled by the P. T. Cox Contracting Company. It involves, at present, 18,000 wood piles, spaced 2-ft. 6-in. centers, driven as a mat covering two city blocks. Piles average 30 ft. penetration, the majority with points 8 in. to 11 in. diameter, with butts up to 16 in. The driving is very hard, into a dense, heavy mixture of coarse sand and clay.

We have been easily maintaining 50 piles per 8-hour day per hammer," writes the P. T. Cox Contracting Company. "We have found McKiernan Terry 9-B Hammers very satisfactory in every respect."

The equipment on the job consists of five 9-B Hammers, operated in two travelers with swinging leads, each operating two hammers; and one land rig. Note perfect condition of pile butts in photograph.

Bulletin 31 describes all McKiernan-Terry Hammers.

McKiernan-Terry Drill Company

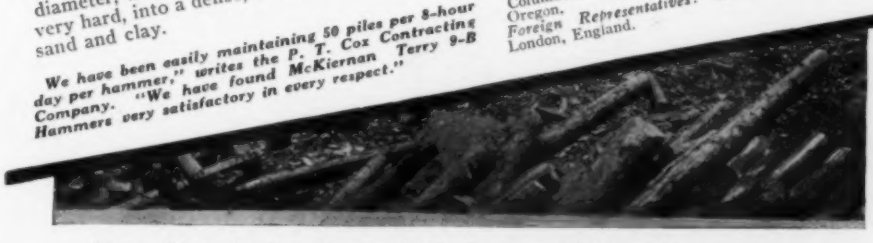
Rock Drills Pile Hammers Lifting Jacks
Mining and Quarrying Machinery

19 Park Row, New York

Works at Dover, N. J.

Agencies in the following cities: Boston, Chicago, Pittsburgh, Cleveland, Detroit, St. Paul, San Francisco, Columbus, O., New Orleans, Philadelphia, Portland, Oregon.

Foreign Representatives: British Steel Piling Co., London, England.



Is Price the

WHEN every one wants mixers and wants them quickly, *any* mixer finds it easy to get *any* price. That is always a period of over-pricing! When mixers are hard to sell, it is easy to build down to a low price — to sell on a low price in a slow market!

But, isn't it true that the leadership manufacturer has everything to lose and nothing to gain in either over-pricing or under-building? *His* future rests absolutely on the good will and confidence of his customers.

In good times he may see poorly constructed mixers selling at prices equal to his better mixer. In poor times he may see other machines built down to low prices, and competing on the price basis. But the leader cannot compromise quality. The leader must never take price advantage of a big demand or cut quality to lower prices when mixers are hard to sell!

No one questions the leadership of the Koehring Company — in volume of business — equipment to manufacture economically — in the development of the modern mixer — in service — in values — in deserving the outstanding confidence of contractors. That's why Koehring prices will always represent Koehring value, actual mixer quality, a reasonable profit — and no more!

Koehring means stability of value and price — always!

KOEHRING COMPANY

PAVERS, MIXERS--GASOLINE CRANES, DRAGLINES AND SHOVELS

MILWAUKEE, WISCONSIN

Sales Offices and Service Warehouses in all principal cities

Foreign Dept., Room 1370, 50 Church St., New York

Canada, Koehring Company of Canada, Ltd., 105 Front Street, East, Toronto, Ontario

Mexico, F. S. Lapum, Cinco De Mayo 21, Mexico, D. F.

A 2568-VII-C

same as Value?

Do You Really Know Koehring Heavy Duty Construction?

Why the Koehring means greater profits—is a better investment? *Why not write for Paver Catalog P. 6*

Paver Capacities—7, 13, 21, 34 cu. ft. of Mixed Concrete. Steam gasoline or electric power. Full length multi-planes, steel rim or rubber tired wheels. Boom-and-bucket or spout distribution. Single or double adjustable derrick on 21E. Auxiliary water tank optional on 21E and 32E. Batch Meter.

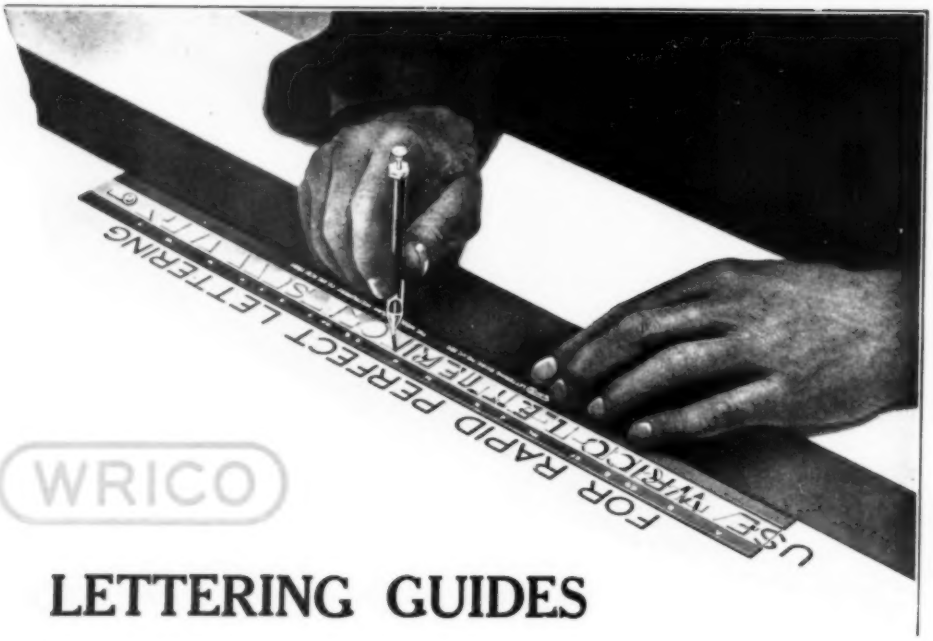
Construction Mixers—10, 14, 21, 28 cu. ft. Mixed Concrete. Steam, gasoline or electric power. Mounted on trucks or skids, Rubber tired wheels optional.

Dandie Capacities

7 cubic feet Mixed Concrete.

Gasoline power. Power charging-skip or low charging platform with hopper, light duty hoist, automatic water measuring tank. Standard or flanged rim steel or disc wheels, rubber tired. Mixes mortar as well as concrete.

RING



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LETTERING GUIDES

Are saving time and improving the appearance of maps and drawings in thousands of drafting rooms throughout the United States

WRICO Lettering Guides are not merely an improvement on some similar form of lettering device. They are a NEW INSTRUMENT, operating on a new principle, for the draftsman. WRICO Guides are to letters and figures what the "straightedge is to the line and the compass to the circle." They enable anyone to do perfect, uniform lettering in a fraction of the time required for ordinary freehand lettering.

THIS COUPON BRINGS YOU FULL DETAILS

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Gentlemen: Please send me a copy of your new illustrated catalogue and price list containing full description of WRICO Lettering Guides and Pens together with complete samples of lettering.

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The Wood-Regan
Instrument Co. Inc.
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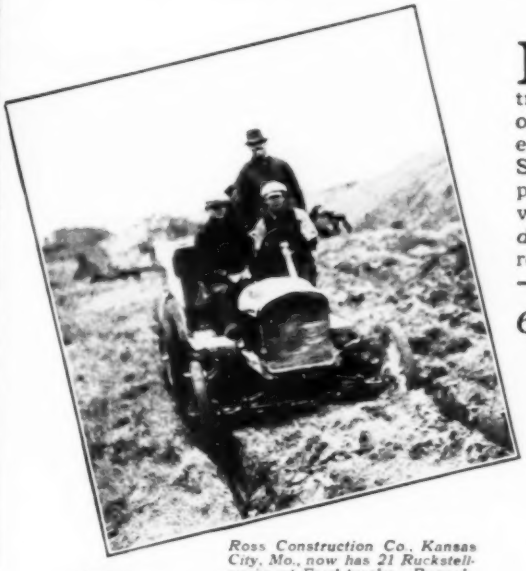
Contractors are saving $1,100.00 Per Year Per Truck, Now!



Ross Construction Co., Kansas City, Mo., now has 21 Ruckstell-equipped Ford trucks. Remarkable savings, unfailing service with extra tonnage assured

NO NEED to invest in heavy, high priced trucks to handle hauling jobs of all kinds. The FORD truck equipped with the RUCKSTELL AXLE replaces high priced equipment, does the work *quicker*, hauls almost *double tonnage*, goes through roads impassable for others—is always ahead of the gang.

60% MORE Power!

—40% *greater* speed, also, if speed is a factor. Goes anywhere, regardless of weather or road conditions. More than 100,000 now in use. Recommended, sold and installed by Authorized Ford Dealers everywhere. Write for startling hauling figures, prices, etc Address our nearest office.

Ruckstell Sales & Manufacturing Company

New York 522 Fifth Ave.
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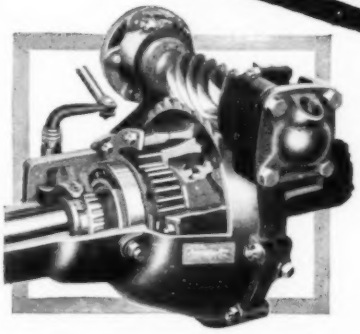
RUCKSTELL AXLE



Not an "auxiliary transmission." Don't confuse the RUCKSTELL AXLE with devices sometimes installed up front, *ahead* of the worm. Such devices change the principle of Ford construction, require cutting or mutilating of Ford parts, add weight, etc. Any Ford Dealer will demonstrate Ruckstell superiority.

Reduce Grading Cost 30 Cents Per Cubic Yard with Fordson

White Bros., Red Bank, N. J., are developing 125 acres near Red Bank, to be known as Knollwood. The entire development of this land including road building, grading, cellar digging, stump pulling and tree removal is handled by seven Fordson Tractors. Six Ford Trucks equipped with dump bodies do the hauling.

Fordson Tractors replaced horses for grading and excavating because Fordsons moved ground at an average cost of 20 cents per cubic yard as compared to a cost of 50 cents a cubic yard when horses were on the job. Besides, Fordsons could build better roads, pull stumps and handle other power operations at a saving in time, money and labor!

The six Ford Trucks equipped with dump bodies are doing heavy trucking work at a surprisingly low cost. They haul gravel and building material from pit and railroad to ground, averaging 25 round trips of 4½ miles each per day. The average mileage per truck per gallon of gasoline is 12½ miles.

Only your own experiences added to this could supply you with more conclusive proof of Fordson Tractor and Ford Truck operating economy and dependability. Why not let your nearest Authorized Ford dealer give you a practical demonstration—on any power or hauling job you have!

Fordson Tractor, $495 f. o. b. Detroit

Ford Ton Truck Chassis, $365 f. o. b. Detroit

Ford

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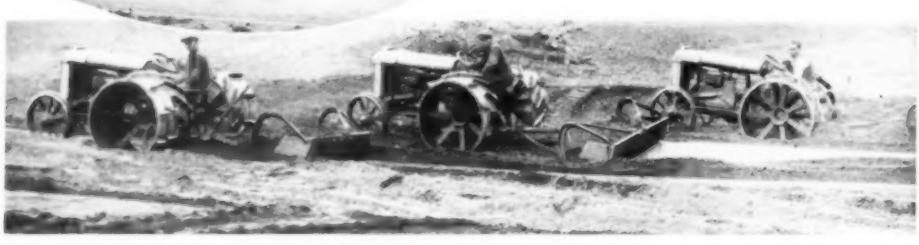

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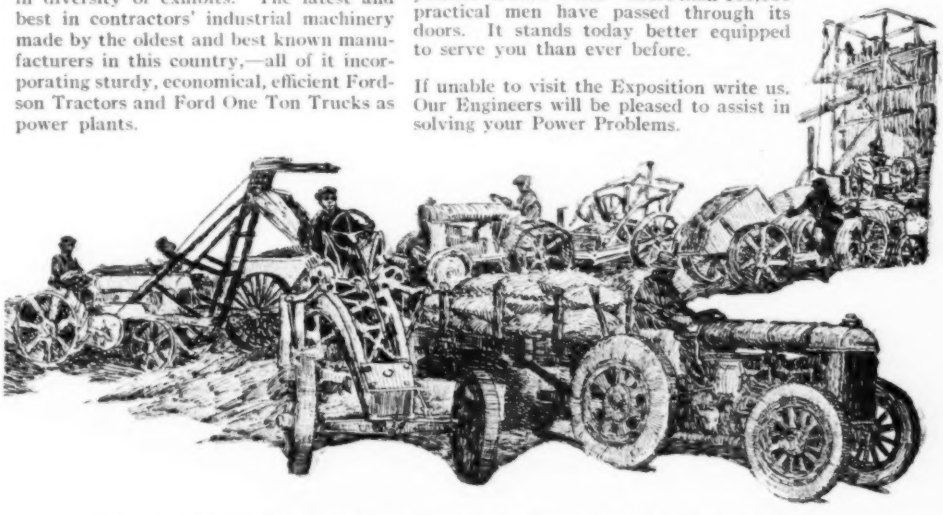

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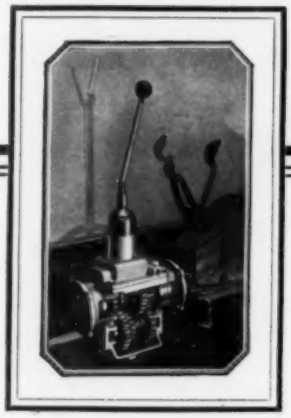

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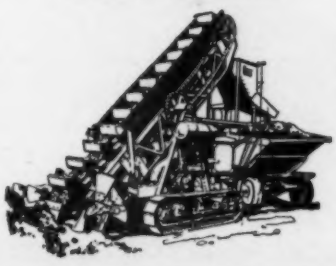

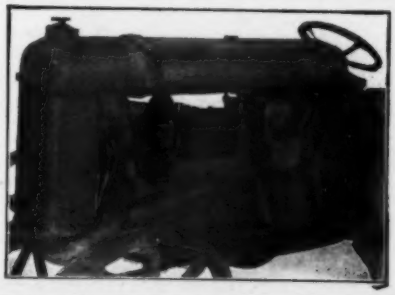

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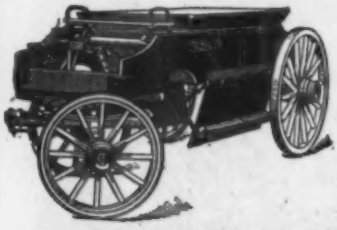

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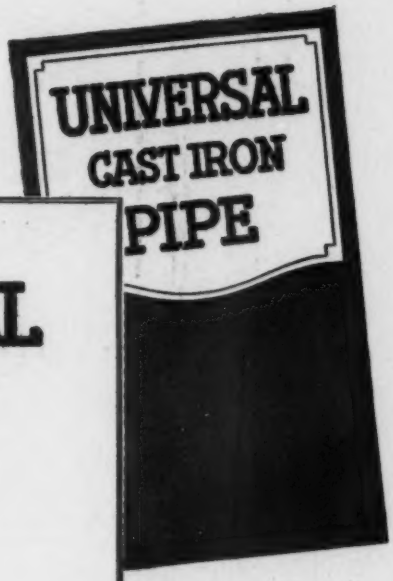

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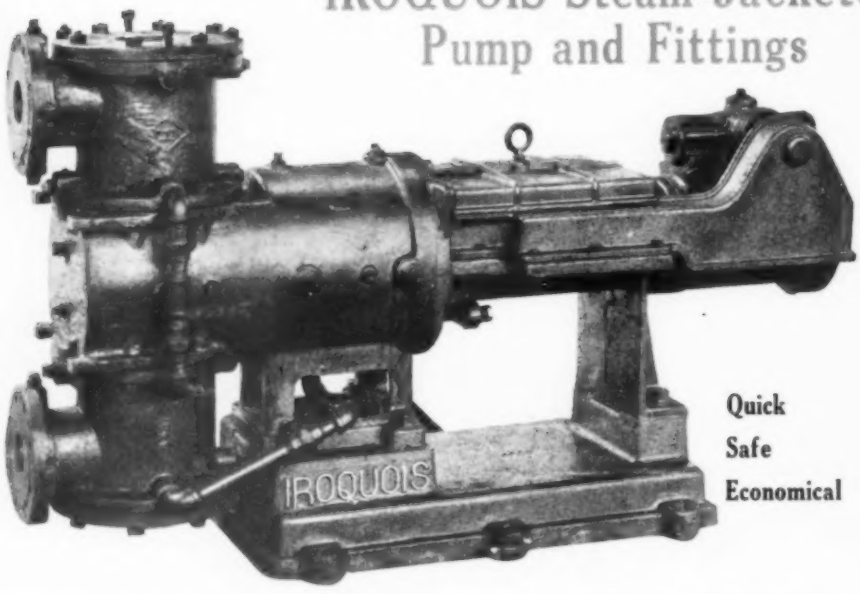

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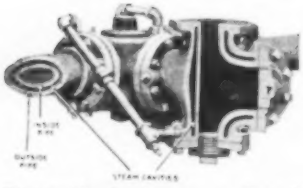

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